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The Municipal Trading Question

THE discussions which took place during the passage of the 1926 Electricity (Supply) Act revealed the chaotic state of the installation and appliance-trading branch of the industry. Although the purpose of the Act was to co-ordinate generation there was a general realisation that the success of the scheme depended ultimately upon increased consumption which, in turn, meant improved methods of distribution of both power and appliances. For this reason a clause was inserted in the Bill giving contracting and trading powers to municipal supply authorities such as were possessed only by a few undertakings. It was, however, stipulated that undertakings were to keep separate accounts of their trading activities and were to charge the proper retail prices to consumers. A committee representative of the industry was to be set up to regulate trading.

This was the unfortunate "Committee D" which after years of labour came to an end with nothing achieved. From its ashes arose the Electrical Fair Trading Council which eventually issued a Fair Trading Policy to which, however, the supply undertakings were unwilling to subscribe, rendering it, we believe, practically ineffective.

Thus eleven years have been spent in attempts to solve a problem which, it would seem, cannot be solved by voluntary means. It is true that in a few towns harmonious relations exist, which proves that here and there men of good will and common sense can arrive at a working arrangement—when the contractors are adequately organised. But the general situation remains untouched by these few bright examples. In most parts of the country there is hostility—veiled or open—between supply authorities and contractors. The antagonism which has been manifested at Southend, and with which we deal in this issue, is, we are afraid, typical of conditions which prevail in many other towns.

As in most disputes there is much to be said for both parties. The contractors have in the past undoubtedly brought a great deal of business to the undertakings—in fact it was necessary to their own existence, but now it is essential to speed up the tempo and introduce facilities to meet gas competition. Such facilities are often uneconomical looked at purely from a trader's point of view, but taking into account the profit from the sale of electricity as well they can be justified.

This implies that they can only be afforded (in both senses of the word) by the supply authorities, but in such a case, what will happen to the contractors and retailers? It is unreasonable to suggest that a body of men who have helped in a very large measure to build up the industry, and are continuing to do so, should be superseded. But the provision of wiring and appliances on the requisite scale cannot be carried out by a large number of small individual concerns.

The supply authorities by their very existence afford the contractor an opportunity of securing a livelihood and they do not see why they should run showrooms, undertake publicity work and provide hiring schemes merely to hand over to contractors any business received as a result of their efforts, or pay the contractors a commission on sales from the showrooms, etc.

It seems that the only alternative is the welding of the numerous small contracting businesses into units large enough to take over much of the development and trading work now carried out by the electricity suppliers. If the contracting situation were different the latter might be glad to free themselves from the problems of providing and maintaining apparatus.

The difficulty lies in the fact that many of the supply authorities have become so deeply involved in commercial activities that the handing over of these to an outside body or bodies would result in a tremendous upheaval. Yet the contractors have visualised such a plan, for Mr. H. M. Drake at the last annual dinner of the E.C.A. outlined proposals for the taking over of the commercial business of the undertakings.

We do not know whether the matter has been pursued further, but we feel that the contractors will have to fight hard for recognition when the imminent Distribution Bill is under consideration. This Bill must, to a far greater extent than the 1926 Act, take account of such matters as the provision of wiring and appliances on easy terms and thus deeply involve electrical contractors and retailers.

Big Business

SOME idea of the magnitude of the sums involved in the provision of domestic appliances for hire and hire-purchase can be gathered from the notes which appear in our "Electricity Supply" section week by week reporting the borrowing of money for the purpose by supply authorities. This week, for instance, we find Swansea seeking sanction to a loan of £30,000; Scarborough requires £20,000; and Taunton is to borrow £10,000. Only a financially strong large-scale organisation can deal with such amounts, and only supply authorities, who can recoup the cost by selling electricity for the appliances, can hope to derive profit from such business.

Christmas Giving

CHRISTMAS Eve and "Review" publication day coincide this year. To many electrical men—and women—1937 has brought increased activity and prosperity; but does not good fortune carry with it a responsibility? In greeting our readers with the season's compliments this morning, may we once more make a suggestion? Will all who feel that they can spare a little extra for their less fortunate fellows send something to the Electrical Industries Benevolent Association (6, Southampton Street, Holborn, London, W.C.1)? Everything received before December 31st will benefit by the President's 10 per cent. bonus promise, and Mr. Parkinson won't mind how large a sum he has to pay, for the need for funds is pressing.

Registration in New Zealand

A RECENT report in a New Zealand contemporary (referred to in our "Business Notes") reflects the operation of the system of registration of wiremen and enforcement of wiring regulations in the Dominion. Forty-five prosecutions are analysed, and the nature of the charges is interesting and instructive. A substantial proportion of the cases related to the execution of installation work by unauthorised persons, including five consumers. Charges were also laid against individuals who permitted others to do wiring work—meaning, presumably, the employment of unregistered labour. There was one case of failure to maintain an electrical installation and one in which dry joints were made in a conductor. Eight prosecutions were taken in cases of connection to supply before obtaining permission. This is not the whole story. The cases referred to were taken up by the Electrical Wiremen's Registration Board, but it is implied that there were others dealt with by electricity supply authorities.

Overseas Trade Position

THE year 1937 will close with no signs that the talked-of setback in trade has adversely affected our electrical export business. The figures for November, given on another page, reveal no faltering in the upward trend, and the advance over last year now exceeds three million pounds. In the general overseas trade of this country last month there was a fall in exports and a rise in imports; with electrical equipment the movements were the reverse. Whereas exports of electrical equipment went further ahead to establish a new record amount for any month in the past seven years, imports were the lowest this year except for February. The fact that there is a demand for British electrical equipment on the scale of the past few months' exports gives every reason for satisfaction.

A Belling Anniversary

CONGRATULATIONS are due this week to Mr. C. R. Belling, who has just completed twenty-five years' connection with the production of electric heating and cooking equipment, a branch of the industry in which his name has become a household word. From the report on a later page of the pleasing function held last week to celebrate the event, it will be obvious that the founder of the Enfield company has not pursued a policy of hiding his "light" under a bushel. He attributes his success to bringing his products before the trade and the general public through an enterprising Press advertising and showroom policy. Mr. Belling marked the twenty-fifth anniversary by contributing £5,000 for the inauguration of a pension fund.

Engineers of the Future

THERE were noticeable differences in the viewpoints of the eminent authorities on technical training who took part in the I.E.E. discussion on electrical engineering education. Some of these differences went fairly deep, even though all opinions appeared to recognise, in one form or another, that the main work of the engineer lies in the application of science in a common-sense way. As the future of the I.E.E. depends upon the calibre of those who will form its corporate membership, the discussion has indicated the propriety of the Institution's setting up of a section or group, as was suggested, or taking other appropriate steps to deal with matters relating to the subject, especially in its relation to the needs of industry and of research. Worthy of especial consideration is the means for cultivating the ability to make full use of knowledge, which otherwise takes long to mature, and the power of exercising the imagination so that later the essentials of new ideas may be readily perceived.

Gas Goes Up

LAST week the Gas Light and Coke Co. announced that the price of gas is to be raised from January 1st owing to increases in the cost of labour and materials. Although the increase is a small one (about 3½ per cent.) it comes at a time when some of the London electricity undertakings have just reduced their prices. It would, however, be unwise to make too much capital out of this, for the substantial increase in the coal bills of electricity undertakings may yet force some of them to stay the general downward trend of their charges, if not actually to raise them. As in the case of derating, public utility undertakings are being milked for the benefit of other industries. Indeed, put bluntly, we have all got to pay more for improving the lot of our fellows, and in consequence we all want more wherewith to pay that more.

Starting Motors

IT is disappointing that, more than two years after the publication of the recommendations of a joint committee of the I.M.E.A. and B.E.A.M.A. regarding the starting conditions of electric motors, there should be grounds for the kind of complaint that is being ventilated in our Correspondence section. Indefensible divergencies of practice between different supply areas and apparently quite unnecessary restrictions constitute a real hindrance to the adoption of the best kind of drives and also to speedy and efficient installation. Many of the restrictions fail even to fulfil the intentions of their framers; thus horse-power rating does not provide a true indication of the disturbance to be expected at switching on. There is a good deal of experience in support of the joint committee's main conclusion that the type of motor and method of starting are immaterial provided that the starting current (classified in five ranges) appropriate to local conditions is not exceeded. Presumably, however, supply engineers who continue to enforce such restrictions have some reasons for doing so, and it would be interesting, and probably instructive, to learn what they are.

Hope Deferred?

WE reported last week that the Distribution Bill was in sight, Mr. Burgin, the Minister of Transport, having stated that the text of the new measure would be issued during the recess. The implication of this was that the first reading would be taken before the rising of the House for Christmas. But on Thursday last week, in reply to questions by Mr. Chuter Ede, the Prime Minister said that it was *not* proposed to give the Bill a first reading before Christmas, but he was still hoping that it would be passed in the current session. Ample time would be given to the industry to consider the terms of the Bill before it was debated in the House.

Rolling Stock for New Zealand

Details of coaches and locomotives

ROLLING stock for the first suburban electrified railway in New Zealand is nearing completion at the Preston works of the English Electric Co. The contract includes six two-coach trains and one locomotive and seven sets of electrical equipment for similar locomotives to be built in the Dominion.

Each of the train units comprises a 60-ft. 68-seater motor coach and a 73-seater driving trailer for service on a single 3 ft. 6 in. gauge line of eight miles between Wellington and Johnsonville, five miles of which is a continuous ascent of one-in-forty with tunnels that limit the contact-wire height to 12 ft. 3 in. instead of the 16 ft. employed over open track. The weight of the train unit (without passengers) is 58 tons. Multiple-unit operation of up to twelve coaches eventually is allowed for, but four-unit running is likely to be more usual.

Two self-ventilated motors, connected permanently in series for 1,500 V d.c., are nose-suspended in each of the two bogies and drive through spur gearing consisting of a 17-tooth chrome-nickel steel pinion and a 63-tooth sprung gear wheel. Each motor has a one-hour rating of 165 h.p. and a continuous rating of 120 h.p. and has one weak-field tap. Roller bearings are provided for the armature shaft and sleeve bearings for the axles.

Unit switch electro-pneumatic control has been adopted. A novel feature is that the interlocked compartment housing the 1,500-V control apparatus is situated under the coach floor and forms part of the underframe structure. The saving in space thus secured is important, as the broken underframe

Locomotive in service on the Wellington-Paekakarika line

Motor coach for the Wellington-Johnsonville electrification

construction required to provide steps at the passenger entrances minimises the length of underframe available for equipment, having regard to the need of accessibility for maintenance. This applies especially to switch groups and relays, the whole of which have been mounted between the entrance steps at one side of the motor coach.

On the other side of the coach underframes are installed the rustless unbreakable-type main resistances, a 4-kW motor generator, an air compressor for switch and brake operation and the electro-pneumatic brake. A 53-cell lead-acid battery is also suspended from the underframe. The motor of the motor-generator set is wound for line voltage and the generator supplies the 120-V system for control gear, door and brake operation and coach lighting, the voltage for which is maintained practically constant by a vibrating reed regulator installed in the luggage compartment. A limited supply for emergency lighting is obtained from the battery which floats across the generator terminals.

Driving cabs have been provided at both ends of the motor coach and at one end of the trailer coach. These occupy only the space between the coach side and the centre end door, a width of 3 ft. and a depth of 4 ft. from front to back being allowed. In the cab is a master controller fitted with a plunger-type dead-man's handle and incorporating inching, series, parallel and weak-field notches, an electro-pneumatic brake controller and the low-voltage control switches. A colour-light signal indicates that all pneumatically controlled passenger doors are closed and a relay interrupts the control supply until they are so.

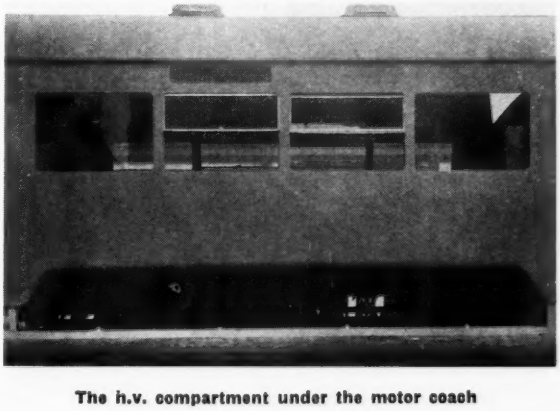
Depression of a push button causes a shunt coil on the current limit relay to become operative, thus giving the driver some control over the rate of acceleration, which is required to be 1.5 m.p.h. per second on a 2½ per cent. grade or on the level with a single motor coach or a motor coach with one or two trailers.

The pantograph is mounted at one end of the roof, which also supports a choke coil, condenser-type lightning arrestor and main fuse. Owing to the lowness of the contact wire in tunnels, the roof under the double-pan pantograph is lowered, but a clear height of 6 ft. 6 in. is obtained in the passenger compartment.

Electro-pneumatic brakes operate through normal rigging on to the bogie wheel-brake blocks, and hand-brake pillars and emergency brake valves are located in the passenger compartments. Track-operated automatic train stops are also provided.

Ten 500-W 150-V heaters, connected in series across the line, are placed along each side of a coach.

The function of the 89-ton locomotives is to haul 250-ton passenger trains at 55 m.p.h. and 500-ton freight trains up to 45 m.p.h. on the twenty-five miles of 3 ft. 6 in. gauge track between Wellington and Paekakariki. They will be capable of a tractive effort of 18,000 lb. per hr. for one hour and 34,000 lb. as a maximum. Their wheel arrangement is 2-8-4.



The h.v. compartment under the motor coach

Four motors with an individual one-hour rating of 310 h.p. are rigidly bolted to the frame of each locomotive. A 19-tooth nickel-steel pinion and a 71-tooth gear wheel are provided between the armature and the quill and the entire weight of the motor is spring borne. The quill consists of a hollow steel shaft fitted over the axle between the road wheels and carried by bearings supported from the motor frame. To one end of the quill is keyed a cast-steel centre upon which the solid steel gear wheel is shrunk and at each end is a set of six spring cup brackets secured to faces in the flange remote from the gear wheel and in the gear wheel centre. The torque of the traction motors is transmitted by radial keys from the quills to the brackets, which project between the spokes of the driving wheels, and thence by spring cup units to the driving wheels.

The spring cup drive unit consists of a housing containing a compression spring which is held in place by two case-hardened steel cups fitted over each end of it and sliding in case-hardened bushings at each end of the housing. The cups are provided with shoulders that engage the inner faces of the bushings, thus limiting outward travel. Before the spring goes solid under compression, these units engage in either direction of travel with the spokes of the driving wheel to which are welded hardened steel plates to take the thrust. When free the cups are slightly clear of the pads. Among the advantages claimed for this type of drive are that the springs are subjected to pure compression stresses only, that each cup drive unit can be removed independently of other parts, and that broken springs cannot cause damage to other parts.

The traction motors are forced ventilated by motor-driven blowers. They are operated on the series-parallel system, with one pair permanently connected in series. Control is of the unit switch electro-pneumatic type. The whole of the 1,500-V control gear, motor generator, blowers and compressor motors are mounted in an interlocked compartment in the superstructure, to which access cannot be gained until all high-voltage apparatus is dead. Starting equipment for these machines is installed in a separate compartment, the switch handles being operated from the driver's cab at each end of the locomotive.

There are two pantographs of the graphite-lubricated double-pan type, operated by push-button switches from the driver's cab. An oil-fired boiler is installed for heating the coaches (1,250 lb. of steam per hr.). Automatic and straight air brakes (Westinghouse) and an independent hand brake at each end of the locomotive are provided. Other pneumatic items are windscreen wipers and a pedal-operated sanding system. Tecalemit nipples for grease lubrication of all wearing parts are fitted throughout the coaches.

The whole of the contract was carried out by the English Electric Co., Ltd., as main contractor, to the order of the High Commissioner for New Zealand, for whom Mr. R. J. Harvey acted as consulting engineer. The sub-contractors were: Robert Stephenson & Hawthorns, Ltd., mechanical parts; Westinghouse Brake & Signal Co., Ltd., air-brake equipment and air compressors; G. D. Peters & Co., Ltd., pneumatically operated door equipment; Rheostatic Co., Ltd., main resistances; Chloride Electrical Storage Co., Ltd., batteries; Pyle National Co., head lights; Skefko Ball Bearing Co., Ltd., roller bearings; Visco Engineering Co., Ltd., air filters; Siemens Electric Lamps & Supplies, Ltd., cable; Simplex Electric Co., Ltd., conduit; and Sentinel Wagon Works (1936), Ltd., train heating boilers.

Two further sets of electrical equipment are also being supplied by the English Electric Co. for use on the Midland Line of the New Zealand Government Railways. The locomotives will be erected by the railway engineers, and the material for the mechanical parts will be provided by Robert Stephenson & Hawthorns, Ltd. These locomotives will not have boilers and are designed for rheostatic braking as they will handle mixed traffic over the heavily graded line between Arthur's Pass and Otira.

Rectifiers for Electrolytic Processes

Canadian experience with the mercury-arc type

PARTICULARS of the mercury-arc rectifiers in use at the Trail plant of the Consolidated Mining and Smelting Co. were given in an address by Mr. A. G. Dickinson at a meeting of the Canada Electrical Association recently.

Each unit consists of two 5,000-A tanks operating in parallel from one rectifier transformer. Three installed in 1929 in the zinc works are of 5,600 kW at 460-560 V and three installed in 1931 at the hydrogen plant are of 6,700 kW at 600-670 V. Two others with outputs of 8,300 kW at 740-780 V were put into use at the hydrogen plant last year and a similar one is on order.

In the zinc works the voltage is first stepped down from 60 kV to 13.2 kV; the rectifier transformers are provided with on-load tap-changing switches on the high-voltage windings to give twenty-four voltage steps. In the hydrogen plant voltage regulating transformers are installed on the 60 kV bus just before the rectifier transformers.

No trouble was experienced in operating the rotary convertors installed at the zinc works on account of the harmonics in the power supply due to the six phase-rectifier transformer connection. Telephone interference was experienced on the power company's private line which runs on the same poles as one of the transmission lines. This was overcome by the use of amplifiers and potentiometers, the voice volume being raised above the noise volume. No radio interference has been noticed. Changes made in the rectifiers supplied in 1929 include the provision of grid control, high-speed breakers and closed-circuit cooling.

Suppression of Backfires

The production of hydrogen by electrolytic decomposition of water requires a large amount of d.c. power. When the hydrogen plant rectifiers first went into operation the suppression by means of grid control of backfires was not as satisfactory as expected. Tests to ascertain the value of current flowing back from the hydrogen cells on short-circuit gave 28,000 A as a maximum, and the d.c. breakers were not fast enough in operation so that once a backfire occurred the grid control device could not interrupt the arc until the d.c. feedback from the cells and between cylinders was stopped, but high-speed d.c. breakers in the cathode connection to each cylinder improved the performance. Closed-circuit cooling systems replaced the original tap water cooling. In the 1936 installation eighteen-anode rectifiers were supplied instead of twelve as in all other instances.

In some cases several months' satisfactory full-load operation was obtained before troubles warranted changes in the equipment. In 1935 when six rectifiers were in commission there were only twenty-seven backfires in the hydrogen plant and thirty-six in the zinc. Odd backfires are often difficult to explain, but increasing regularity indicates defects such as faulty vacuum and broken or dirty insulators.

In the zinc works there are ten 550-V 2,500-kW rotary convertors installed between 1925 and 1927 and thirteen 125-V 1,000-kW motor generators installed between 1916 and 1917. Time lost due to changes in equipment, maintenance and repairs as a percentage of the total possible operating time for 1935 was 0.62 for the hydrogen plant rectifiers, 6.07 for the zinc works rectifiers (2.22 maintenance and 3.85 changes in equipment), 7.08 for the rotaries, and 5.55 for the motor generators.

Cost and Efficiency

Operating and maintenance costs for the hydrogen plant rectifiers came to $14,000 ($7,280 operation and $7,020 maintenance), giving $0.713 per kW installed. For the zinc plant rectifiers the figure was $15,600 or $0.929 per kW, and for the rotaries and motor generators $36,000 or $0.947 per kW. Average overall efficiencies for the zinc works were 86 per cent. for the motor generators, 96 per cent. for the rotary convertors and 93.5 per cent. (including 1.3 per cent. loss in the rectifier transformer) for the rectifiers.

The staff at the hydrogen plant consists of one senior and one junior operator on each eight-hour shift under a chief operator; there is one maintenance man. At the zinc works one man on each shift operates the rectifiers. Supervision, maintenance and repairs are carried out by a chief operator and maintenance crew who also look after the rotary convertors and motor generators. Vacuum and circulating pumps require regular maintenance along with tap-changing equipment and a.c. and d.c. breakers. Water jackets are cleaned out periodically, but the vacuum chambers of the rectifiers are not opened unless there is some indication of trouble. One cylinder opened recently had been in service for four years. Other cylinders in service the same length of time are still operating without sign of trouble. There are indications, however, that it is advisable to open up the rectifier cylinders for general cleaning every four or five years.

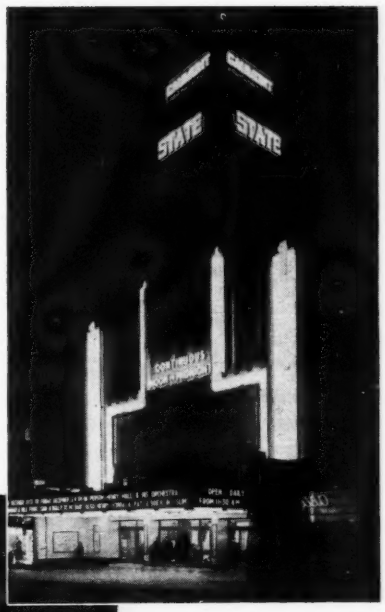
Equipment for d.c. voltage control by means of energised grids was installed experimentally several years ago on one of the original hydrogen plant units and worked fairly well. The last two hydrogen plant units have grid-voltage control for starting up and putting the unit on load, resulting in a considerable improvement.

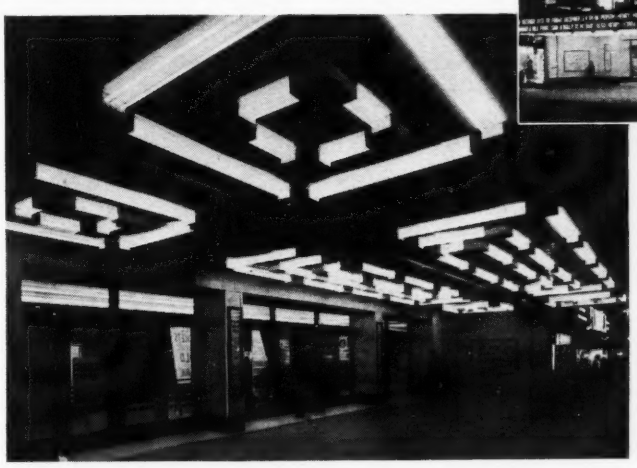
A Large Cinema

Details of the equipment at the new State Cinema, Kilburn

LAST Monday saw the opening of what is claimed to be the largest cinema in Great Britain, if not in Europe. Extending over 3½ acres, this new Gaumont State Cinema at Kilburn has seats for over four thousand, with waiting rooms, restaurants, &c., capable of holding an equal number. The fact that it has a total connected load of about 1,000 kW gives some idea of its importance electrically.

Probably the stage equipment provides most in the way of electrical novelties, the lighting arrangements in particular having a number of unusual features. Behind the usual "No. 1" colour-lighting batten incorporating about eighty 150-W lamps are two four-sided revolving battens operated and controlled electrically by small totally enclosed motors at the ends. With this device it is possible for the whole (instead of one quarter) of the 120 150-W lamps on each batten to be brought into service at the same time to give more intense primary colours than possible with a customary four-colour batten. The same idea is to be seen in four hand-revolved wing tower "floods" having twenty-five 150-W lamps one above another. Ordinary wing floods taking 1,000-W lamps are mounted in banks of threes.

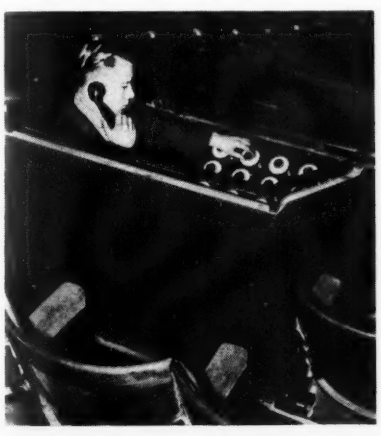




Canopy lighting at the new State Cinema, Kilburn, and the 100-ft. tower which is illuminated by floodlights and by 1¾ miles of neon tubing [*Elec. Rev. photos.*

A huge cyclorama measuring about 80 ft. by 35 ft. at the back of the stage is illuminated from the top by a special batten of seventy-two 500-W "Cyclorama" floods, and from the bottom by banks of fittings in a pit below stage level. The latter taking 150-W lamps are grouped in twenties in nine compartments extending the whole width of the stage.

To enable the stage to be extended over the orchestra pit, thereby providing a total stage area 60 ft. deep by 100 ft. wide, the footlights comprising nine banks of twenty-two 150-W fittings supplied by the Major Equipment Co., Ltd.) can be concealed by flaps which can be let down flush into the floor. In addition, or when these footlights are thus out of commission, a battery of thirty 500-W lamps inset in the edge of the circle can be brought into service. Three of these on each side are in circuit with a solenoid-actuated colour-changing device. To control this elaborate stage lighting installation covering three hundred circuits an extremely compact switchboard measuring 14 ft. 6 in. in length has been supplied by the Strand Electric & Engineering Co., Ltd., who were responsible for all the stage lighting equipment except the footlights. In conjunction with this board is a plug board enabling any dimmer to be plugged into any dip box.



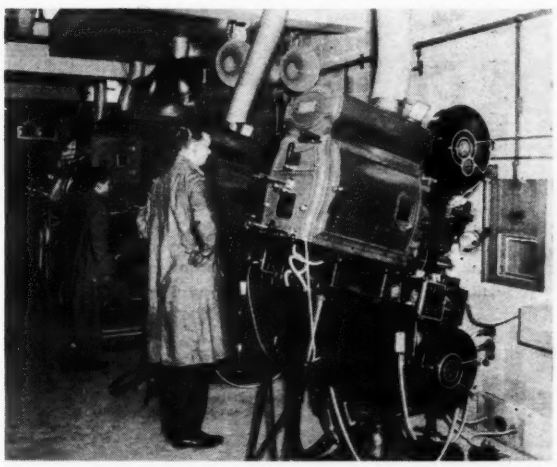
From this box in the centre of the circle one operator can control the whole of the action on the stage and balance the various microphones to give the best effect [*Elec. Rev. photo.*

The disappearing footlights, as well as other mechanical stage equipment, were provided by Knight & Co. (Engineers), Ltd. The whole of the orchestra pit can be raised electrically to the level of the stage, and the Würlitzer organ is on a separate lift enabling it to be raised, revolved, or concealed from sight to give further stage room. Guard rails can be raised out of the floor to prevent the risk of artists falling into the orchestra pit when performing on the strip of stage in front.

An ingenious revolving stage system permits practically any required arrangement of scenery. Composed of twenty-eight different light-metal sections, it is designed to give in the normal way 20 ft. or 30 ft. diameters, but it can be readily adapted for square, rectangular, triangular, &c., formation. Its principal recommendation, however, is that it need not be fixed in any definite position, each section being on rollers. The power necessary to operate it comes from a 6.5-h.p. "Asea" shunt motor with a Ward-Leonard system of control and supplied by a motor-generator. This equipment was supplied by the Hall Manufacturing & Supply Co., Ltd., who also installed an electrically operated preset contour device for arranging the curtain in any shape required.

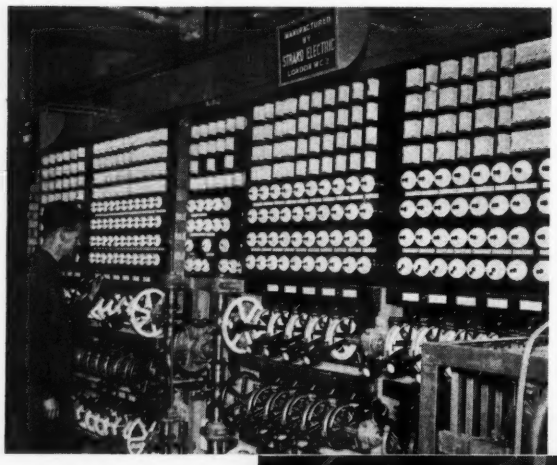
Provision is made on the stage for twenty-five microphones, of which eleven can be immediately raised through traps in the boards by means of counterbalanced hand control. Any twelve microphones can be used at once, separate volume controls being provided for each.

In addition to the stage manager's control panel next to the stage lighting board there is a separate control board situated in the centre of the circle controlling the whole of the working of the stage, including the loudspeakers and microphones to be regulated to produce the best effect. Altogether there are



The projection room with the Brenkert projectors in the foreground [*Elec. Rev. photo.*

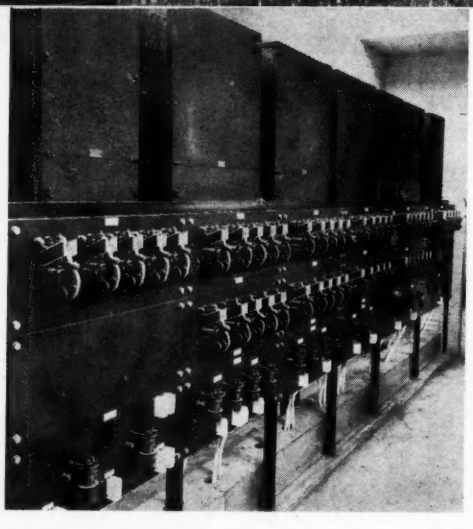
sixty-six loudspeakers in the auditorium, and besides these there are ten installed at other points in the restaurant, foyer,



The Strand stage lighting control board shown above is 14 ft. 6 in. long and is one of the most compact of its kind ever constructed [*Elec. Rev. photo.*

&c., and eight are employed in the control system. All the sound equipment, including a radio-gramophone in the restaurant, was supplied by British Acoustic Films, Ltd. Automatic telephones (Standard Telephones & Cables, Ltd.), give direct line communication to all important points, either singly or all together. A special broadcasting studio has been incorporated in the 100 ft. tower.

Equipment of the projection room consists of three Brenkert projectors (American machines, believed to be the only ones in use in this country), two Brenograph machines giving special lighting effects during organ interludes, &c., a Stelmar



An out-size in resistance panels for controlling the projector arcs [*Elec. Rev photo.*

"biunial" slide lantern and a Stelmar spotlight (three more of these are in the lime chamber). "Magnascope" control enables picture size to be variable from 26 ft. up to 40 ft. wide, and each machine has its own panel for controlling the apparatus and the curtain and for communication with the stage. Each of the Brenkert lamps for projection takes up to 200 A, the normal operating load being about 180 A; the arc voltage is about 75 V. Supplying these are three 350-A E.C.C. rectifiers. All these can be in parallel as under some conditions the maximum load is 1,000 A. An exceptionally large resistance panel required in connection with the arcs was constructed by F. H. Pride.

It is not only on the purely "presentation" side that the electrical installation is outstanding. Particular care has, for instance, been taken in obtaining lighting fittings to harmonise with the luxurious scheme of decorations everywhere apparent. Predominant among several variations of bronze or frosted glass pendant and ceiling fittings employed in the auditorium is a tremendous pendant in the centre of the ceiling weighing nearly a ton. Under the circle two large circular coves are the source of a very soft light, and a four-colour cove forms a "halo" round the proscenium.

There are massive crystal fittings (one of which, containing no fewer than 125 lamps, is a replica of a candelabra in the ballroom at Buckingham Palace) in the imposing main vestibule and staircase. All the above fittings, together with the direction sign were supplied by F. H. Pride. Longlamps, Ltd., provided 400 ft. of striplamps. A Chloride "Keepalite" system comes into operation should a failure of the main electricity supply occur.

On the outside of the building there are one and three-quarter miles of red and green neon tubing (Electric Sign Co., Ltd.), and the tower is floodlighted by Franco equipment.

For heating and ventilating the building J. Jeffreys & Co., Ltd., under the supervision of Mr. L. W. Henton, consulting engineer to the Gaumont-British Picture Corporation, Ltd., have installed a plenum plant claimed to be the largest of its kind in Europe. Fresh air is brought in from outside, is thoroughly filtered, washed, and heated to the desired temperature and is passed into the cinema through an air duct big enough to allow a large motor-car to be driven through. The plant deals with 240 tons of fresh air per hour and requires 125 h.p. (provided by electric motors of Laurence, Scott & Electromotors construction) for its operation. The heat for warming the fresh air and radiators throughout the building is generated by three large boilers, which are automatically fed and stoked, and have a heating capacity of 12 million B.T.U.s per hr.

Ninety-three miles of mains and v.i.r. cables have been installed in the building for power and lighting. An important factor which arose in connection with these was the immediate service required by the electrical contractors, Troughton & Young, Ltd. Johnson & Philips, Ltd., were able to supply the standard cables from their stock at Columbia House, Aldwych. The main cables were supplied specially for

By using revolving battens it is possible to make use of the maximum amount of light available for any particular colour required [*Elec. Rev. photo.*

their purpose and at no period of the work were the contractors kept waiting. Several J. & P. cable boxes were also employed, including the new type of terminal and dividing box. In the main switchroom Statter circuit-breakers and William White iron-clad switchgear have been installed. Most of the electric motors used in the building were constructed by Laurence, Scott & Electromotors, Ltd. Electric clocks all over the building have been supplied by Synchro Times, Ltd., and incorporate Everett Edgcumbe movements. A Lamson central vacuum cleaning plant serves the whole building.

The electrical work was carried out under the supervision of Mr. A. Gale, chief engineer to the Gaumont Super Cinemas, Ltd., Mr. S. Hart, chief engineer to the Gaumont British Picture Cpn., Ltd., being the consulting engineer. Much of the special equipment was produced to the design of the Gaumont engineers.

Troughton & Young, Ltd., who, besides acting as electrical contractors supplied several of the smaller lighting fittings used, tell us that this is the thirteenth cinema installation carried out by them this year.

A 250-ton Floating Crane

What is claimed to be the largest floating rotatable crane, which is capable of lifting 250 tons, has recently been installed at the French naval arsenal at Brest. It is of partly vertical and jib construction and is mounted on a pontoon 196 by 111 ft. by 16½ ft. in depth), the interior of which forms the engine room. The plant installed in the latter comprises 80 and 19-kW Diesel-driven d.c. generators. Two 95-h.p. electric motors with reversing gear for driving the pontoon propellers and four for operating 10-ton capstans located at each corner of the pontoon, exhaust, fire and fuel-oil and lubricating pumps. There are also 136- and 41-h.p. 220-V three-phase motors for use when the pontoon is moored alongside a quay where it can be linked up to a local a.c. power system. Other features are a fuel-oil tank, a 400-ton cement counterweight and cabins for the captain and crew. The jib, the turntable for which is mounted on the square, vertical portion of the crane at a height of about 89 ft. above the pontoon deck, has a length of 221 ft.

Electrostatic Generators

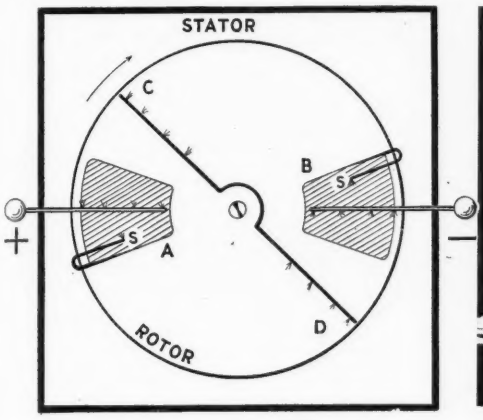
By A. Mortimer Codd, F.Ph.S.

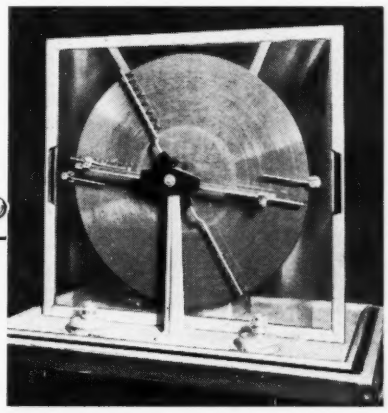
Improving their practical value

The author has designed a machine which, he claims, overcomes the disabilities of older types

AS it is now some fifty years since any considerable advance was made in this country in electrostatic generators it seemed to me that with improvements in insulating material, and possibly by new methods, such machines might be bettered, so as to render them of commercial utility instead of scientific marvels. The disadvantages of existing machines are: fragility and bulk, feeble output, uncertainty in action due to climate, and liability to reverse.

It was first necessary to discover whether the Holtz-Voss-Töpler machine with one revolving disc and a fixed stator or the Musaeus-Wimshurst with two oppositely revolving discs would be more practicable. The first step to increase output should be to increase the speed,* but glass rotors obviously limit this. Experiments were made with ply-glass, both glass-celluloid-glass and celluloid-glass-celluloid, but it was found impossible to balance the discs at more than a few hundred r.p.m.

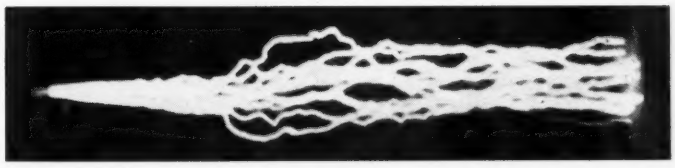




The author's electrostatic generator

A machine of the Wimshurst-Bonetti type with ebonite rotors was next constructed but at high speeds the discs snaked and weaved about uncontrollably at the circumference, thus making brush contact difficult; also the machine was noisy due to the use of belts, one of which had to be crossed. On this account a machine of the Voss type was set up using a glass stator and an ebonite rotor, the latter being bolted to a flange on the shaft of an electro-motor. Owing to the proximity of the rotor to the stator, all snaking of the disc ceased, due partly to the damping of the stator and partly to electrostatic attraction between the stator and the rotor. Thanks to this, much thinner discs could be used and run at speeds quite impossible to attain in free air.

Several of the features of the classical machines were dispensed with, *e.g.*, the tinfoil sectors on the rotor and the paper-covered tinfoil discs on the stator. A plain unsectored rotor was actually a considerable improvement, except on the grounds of self-excitation in damp weather as was the use of a comparatively small field plate on the stator. Further, difficulty in excitation and liability to reversal were largely eliminated by the increased speed. The superiority of the Wimshurst machine in both respects had evidently been due to the relatively greater speeds with which the two discs had passed one another, but with a machine in which the rotor passes the stator at a comparable difference in velocity this inferiority disappears. Failure to excite or reversal is due either to insufficient speed or to dampness. With increasing speeds I distrusted the ebonite rotors lest they burst and cast about for a tougher and better dielectric.



A 5-in. spark discharge (0.0011 μF in parallel)

Being much impressed with the enormous electrification of celluloid and particularly "Perspex" these and several similar substances were tested, but although superior for the purpose to ebonite they gave no great gain in output. A rotor of "Paxolin" kindly prepared for me by Micanite & Insulators, Ltd., was next tried, and this, while fulfilling the mechanical requirements, gave a considerable increase in output.

At this point the circular stators of the Holtz type were abandoned and a rectangular shape of glass in a wooden frame was adopted. This arrangement proved much more rigid and free from vibration so that higher speeds still were attempted when a new disadvantage arose. The thinner, within limits, both the rotor and stator are the better the output, but at high speeds the centre of the stator was drawn out to touch the rotor. The rotor itself tends to stay stiff, due partly to the operation of centrifugal force and partly to the effects introduced by electrostatic attraction.

Air drawn in from the central aperture and thrown out as a very thin film between the stator and rotor prevents their binding. In order to stiffen the stator a second sheet of glass was placed behind the first, the field plates being sandwiched between and the edges and central aperture cemented together with paper tape before being inserted in the wooden frame. This largely cured the trouble, but had the unexpected effect of considerably increasing the output.

In order to explain this it is first necessary to consider how the machine works. In the diagram above A and B represent the field plates at the back of the stator fed by the shunt brushes collecting from the rotor at SS. Suppose a positively electrified surface on the rotor approaching A. This surface will first tend to keep the field plate A electrified; then as it passes from the influence of A it is touched by the brushes of the neutraliser CD. This is equivalent to touching the carrier of an electrophorus with the finger, the neutraliser being to some extent simply a "toucher." The surface thus touched as it leaves the influence of A will now be negatively electrified and will thus give up a negative charge to the field plate B and so on inversely till it again reaches A.

The main collector brushes + and − have no action in this case except to divert the superfluous electricity to the main circuit. If, however, the + and − brushes are connected together or are passing a substantial current the neutraliser CD can be removed and the machine will continue to work, since the main brushes are now acting not only as collectors but as "touchers" also. Should, however, the current between + and − fall off the main brushes will no longer act as neutralisers and the machine will reverse and probably discharge. The neutraliser CD is, therefore, retained to act as a safety "toucher" when the machine is on open circuit, and as a balancer to ensure that both semi-circles are equally electrified when the machine is loaded.

That no current flows between C and D on load can be proved by breaking the neutralising rod and inserting a minute spark gap or, better, a small neon tube which will only light up when the main circuit is broken.

Theoretically, one would suppose the "toucher" brushes should be close to the trailing edges of the field plates, and this is true for starting in damp weather or for small spark gaps, but the best general position appears to be at about

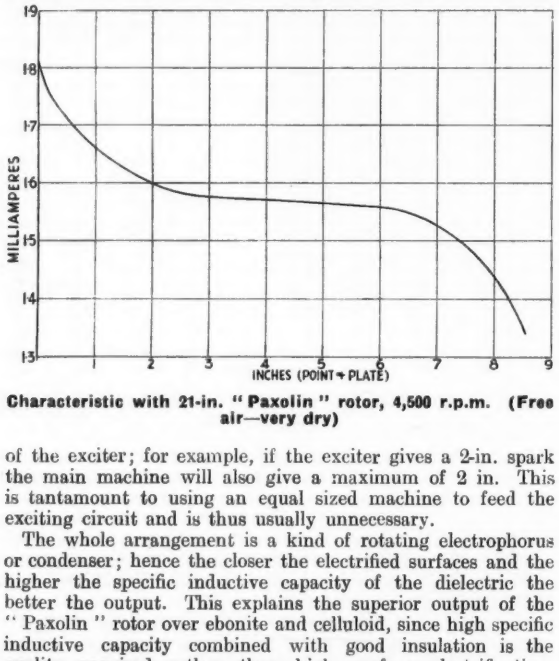
* Modern High Speed Influence Machines. V. E. Johnson (E. and F. N. Spon).

60 deg. from the leading edge of the field plate. The neutralising rod itself is best insulated so that it acts as a floating balancer between the two oppositely electrified semi circles. The angle of the field plates should be about 30 deg. and the depth about a quarter of the diameter of the rotor, but this depends on the spark length and quantity of current desired. Too great a spark length will cause the current to discharge between the two main collector brushes.

The electric field set up round the field plates would seem to be distorted in the direction of rotation in a similar way to the magnetic field of a dynamo, thus accounting for the displacement of CD to as much as 60 deg. This suggests that the improvement experienced by the use of the double-glass stator is due to this effect also. As the gap between the + and − dischargers is increased so is the tension applied to the field plates in shunt. In this way the whole electrical system is to a large extent self-balancing.

The distortion of the field is proved by the failure of the machine to excite if the stator is made in two parts; further, if windows similar in size to the field plates are cut in the stator remote from A and B the output is much lowered and as the openings are rotated anti-clockwise towards the field plates the output falls off to nothing as they become adjacent. The field plates themselves are extremely sensitive, and although they consume hardly any current they must be most carefully insulated and removed from all outside influence, for on them depends largely the efficiency of the machine.

The potential of these field plates is approximately that of the exterior circuit, for they may be fed by a separately excited machine, but the spark length given will then be that



Characteristic with 21-in. "Paxolin" rotor, 4,500 r.p.m. (Free air—very dry)

of the exciter; for example, if the exciter gives a 2-in. spark the main machine will also give a maximum of 2 in. This is tantamount to using an equal sized machine to feed the exciting circuit and is thus usually unnecessary.

The whole arrangement is a kind of rotating electrophorus or condenser; hence the closer the electrified surfaces and the higher the specific inductive capacity of the dielectric the better the output. This explains the superior output of the "Paxolin" rotor over ebonite and celluloid, since high specific inductive capacity combined with good insulation is the quality required rather than high surface electrification. "Paxolin" also is not acted on by ozone as is ebonite, and if the brush carriers and other metal parts are chromium plated no deterioration is experienced due to gases liberated.

In these experiments brushes were used instead of point or comb collectors as they pick up all the electrification available without undue brushing, so that when suitably loaded the machine runs almost sparklessly. Sparks are generally due to bad design or weak condition.

The length of spark generated is governed by the diameter of the rotor as is also the current strength, since the latter depends on the area of dielectric swept by the brushes. It is not economic to use too large rotors as, owing to the windage, the power necessary to drive the discs increases enormously with the diameter, thus an 18-in. disc requires about 2 A, whereas a 21-in. disc consumes about 6 A at the same speed and voltage.

Should a greater current output be required, four field plates and collectors may be used instead of two; this will double the current and reduce the spark length by rather more than half. A better way is to fit a second rotor at the other end of the motor shaft with appropriate brush gear and connect the machines in parallel. Should extra long sparks be required, then the diameter of the rotor must be increased, but the peripheral speed should be kept the same so as not unduly to increase windage, but normally a 20-in. disc will do all that is required.

It is not easy to find data of output of electrostatic generators, but curves of output for a 16-plate Holtz with 36-in. discs and a 20-plate Bonetti with ebonite discs of 22-in. diameter* seem to show that my machine with only a single rotor produces from five to twenty times the current and at greater pressures. Moreover, the excitation of the machine described does not die away either on open circuit or when short circuited. The full-gap discharge generates large volumes of ozone which will render a fair-sized room untenable in a few minutes, while with a Leyden jar condenser over the gap the spark discharge is shattering.

The next difficulty to be overcome was the sensitiveness of the machine to climatic conditions. The classical experimenters were to some extent aware of this, but I think they did not realise that conditions varied not only from day to day but from hour to hour; also their lack of instruments for direct measurement must have been a handicap, for there is no greater check to undue optimism than a milliammeter in circuit. It is true that it is possible to start an unsectored machine in free air of even 95 per cent. relative humidity with attention and that a rotor with even as few as two sectors will generally start without any trouble, but the effect of sectors is to reduce the maximum output some 40 per cent.

Overcoming Humidity

To avoid this the use of a sectorless rotor was preserved by covering the machine with an air-tight glass cabinet furnished with radiator lamps and a silica-gel drying device. This arrangement proved quite satisfactory as to starting and also for running for some little time, depending on the load. Eventually, however, with some loads, generally of high tension, the air in the cabinet becomes ionised and the output tends to fall. In this case a door must be opened slightly to ventilate the case. The admission of free air does not matter as by this time the motor has warmed up and tends to keep the cabinet dry.

The cabinet does not render the machine entirely independent of atmospheric conditions because really dry free air is the best state in which to operate,* but it makes the machine commercially reliable even in the worst weather, so that it can be switched on like any other piece of electrical apparatus.

Current supplied by this sectorless machine is absolutely continuous or pertinaceous and not direct, such as is furnished by rectified alternating current. The use of sectors tends, I suggest, to furnish merely direct and not continuous current in that as each sector discharges there is created a pulsation which destroys true continuity. When used to excite an X-ray tube the screen presented is as still and brilliant as full moonlight.

In the machine described I believe the disadvantages of electrostatic generators to have been largely overcome. For small high-tension currents it is not only much cheaper than the transformer or coil, but also simpler and less liable to break down; neither does it need oil for insulation. Further, as it supplies continuous current it eliminates the use of costly valves and their ancillary filament transformers and condensers.

Almost any reasonable output would seem obtainable without undue bulk, cost or complication. The machine should have fields of usefulness for spectroscopy, ozone production, electroculture, exciting cathode tubes, electro-therapeutics, insulation testing, and many other applications within and without the laboratory where a liable, cheap and simple generator is required.

* "The Current-voltage Characteristics of Electrostatic Machines." E. J. Evans. *Proceedings* of the Physical Society. Vol. 38, Part 5, p. 463, August 15th, 1926.

Power Station Reconditioning

The modernisation programme for Waterside No. 2 station of the Consolidated Edison Co. of New York will, the *Electrical World* states, bring its ultimate capacity up to 312,000 kW by the addition of four 53,000-kW turbines operating at 1,200 lb. and 900 deg. F. and exhausting at 200 lb. per sq. in. into the existing steam range. One of these sets is nearing completion and the other is expected to be running next spring. Each set will be served by two 500,000-lb. boilers without steam connection with those of other units. The unit cost of the superimposed turbo-generator capacity is said to be little more than the unit cost of high-pressure condensing equipment at a new plant. Three independent 100,000-kW, 13.2-kV switch galleries separated by fire walls are being constructed, with main and synchronising bus-bars, the former extensively sectionalised. A low resistance earth grid will control the flow of fault currents as a safeguard against damage to secondary and control wiring. Bus-bar circuits are protected by current differential schemes, embodying high-speed induction relays with a minimum time delay of 0.5 sec. Connections between the main or synchronising bus-bars are provided with local differential protection which overlaps the differential of both sets of bars.

Negative Phase-Sequence Protection

By R. M. A. Smith, B.Sc., Grad.I.E.E.

IN the installation of automatic protective gear in certain systems difficulty may be experienced in the relay application, since fault conditions may be only slightly removed in effect from normal-load conditions. For example, a short-circuit on an induction motor may give rise to a fault current no greater in magnitude than the normal starting current taken by the machine; also a distant fault on a transformer feeder may cause a fault current even less than the normal feeder full-load current. In such typical cases ordinary over-current or impedance protection cannot be applied, and it is here that negative phase-sequence protection affords a satisfactory solution to the problem.

On the occurrence of a fault on a symmetrical three-phase system the vector representation of the system currents and/or voltages may be analysed into three component symmetrical groups of vectors, named the positive, negative and zero phase-sequence systems. The positive-sequence component only is present in balanced three-phase fault or load conditions, the positive and negative components are both present during unbalanced phase-to-phase conditions, and positive, negative and zero components are all present in unbalanced phase-to-neutral conditions.

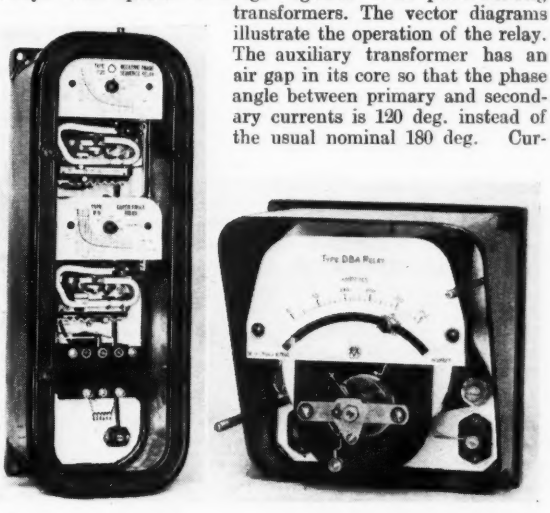
Since the vast majority of faults on three-phase systems are either phase-to-phase or phase-to-neutral, it may be taken that under all normal fault conditions negative phase-sequence components of the system currents and voltages will be present. The term "negative phase-sequence protection" may, therefore, be conveniently applied to protective systems utilising the negative phase-sequence vector component of fault currents and/or voltages for energising the relevant protective relays.

Of the many diverse methods of segregating the negative sequence components of fault currents and voltages, two major methods are being increasingly used in modern protective systems, *i.e.*, that employing a resistance—reactance network on the Wheatstone bridge principle, and a phase-balancing method incorporating a phase-shifting transformer.

An explanation of the two chief methods with the conditions in which they are most efficacious

Methods Using Bridge Network

The connections to the resistance-reactance network of the three line-current transformers and the protective relay in a typical method is shown in fig. 1. The relay R which responds to the unbalanced conditions caused by a system fault is connected across opposite corners of the bridge and, providing the instantaneous sum of the three currents applied to the bridge is always zero, the current in the relay will be proportional to the negative phase-sequence component in the system. To fulfil this condition regarding summation of currents, theoretically the current transformers should be connected in delta. This procedure is objectionable, however, from the point of view of adding other apparatus, but although it is not common practice to operate instruments and the like from protective current transformers, it is usually desirable that the latter should be star connected as indicated in the diagram. In this case the relay does not measure the true negative-sequence component only, but is energised by a current proportional to the negative component plus twice the zero component; the divergence, however, is seldom of great account. Negative phase-sequence protection on phase-balancing principles uses conventional induction pattern relays with special windings together with phase-shifting transformers. The vector diagrams illustrate the operation of the relay. The auxiliary transformer has an air gap in its core so that the phase angle between primary and secondary currents is 120 deg. instead of the usual nominal 180 deg. Currents flowing in the upper relay winding A (fig. 2) under normal balanced conditions are the yellow-phase current and the red-phase current shifted in phase 120 deg. and, therefore, in opposition to the yellow-phase current. The resultant ampere turns due to winding A is thus zero and the relay is inoperative. The occurrence of unbalanced line currents, however, results in the relay winding A giving rise to a resultant flux generated due to the resultant ampere turns derived as shown in the second vector diagram. The relay, therefore, is inoperative under these circumstances. The second relay winding B is connected to the residual circuit of the three line-current transformers and hence is responsive to zero phase-sequence (earth-fault) currents only.

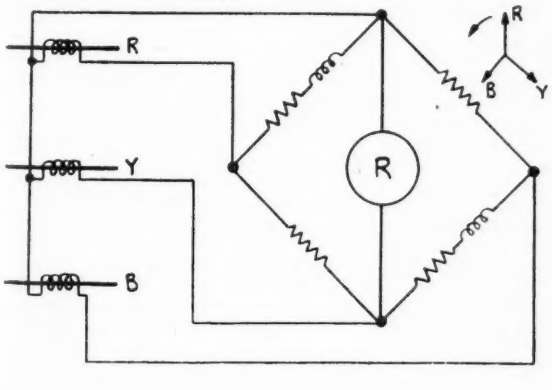


"Metrovick" negative phase-sequence relay for motor protection and (right) sensitive d.c. moving-coil relay

A two-element relay has been developed wherein one element is sensitive to negative phase-sequence currents only, and the other is sensitive to zero phase-sequence currents only.

The choice of method and type of relay used in any application of negative phase-sequence protection depends almost solely upon the range of relay settings required. A subsidiary factor is the type, capacity and characteristic of the operating current transformers.

Where negative phase-sequence current settings of the order of 80 to 200 per cent. full load are required, a bridge network operating either an instantaneous attracted armature type of relay or an induction pattern relay with inverse time/current characteristic may be used. Induction-type relays operating on the phase-balance principle in general are suitable for giving settings of 80 to 200 per cent. The latter are usually adopted only where overload and positive phase-sequence



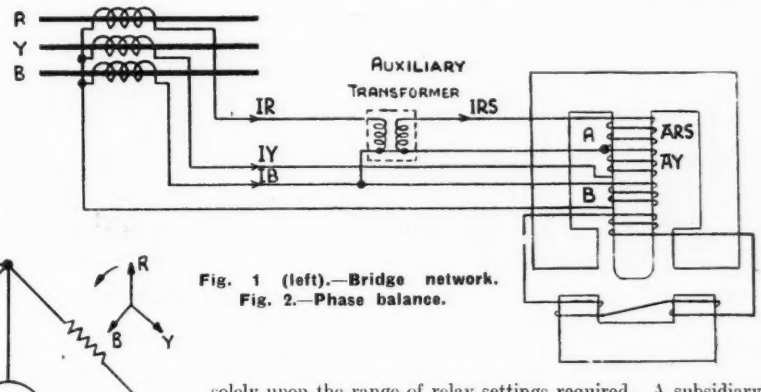


Fig. 1 (left).—Bridge network.
Fig. 2.—Phase balance.

stability are of importance—such as in the protection of motors. When fine settings, *e.g.*, of the order of 2 per cent. unbalance or a continuously variable setting scale is required, a moving-coil type of relay, energised through the agency of a small full-wave metal rectifier, may be employed for the purpose.

The range of settings obtained on any type of relay used with bridge networks is limited by consideration of the relay-coil impedance and the additional burden upon the operating current transformers, due to the shunting effect of the network. In general the higher the relay impedance the less sensitive are the settings obtainable on it.

Applications

In extensive power networks where, due to the reactances of intervening transformers and transmission lines, the fault current due to a distant fault may be small or even less than normal full-load current of the supply lines, difficulty is experienced in the application of ordinary types of protective gear.

In such instances overload protection is of no avail and impedance protective gear cannot usually be applied satisfactorily, but negative phase-sequence relays, in conjunction with auxiliary definite time delay relays, would afford complete and discriminative protection to the system.

A further application, usually using a super-sensitive moving-coil relay, is to the protection of electrode boilers. The I.E.E. Regulations call for all electrode water heaters and electrode boilers to be provided with some form of protection enabling the device to be isolated when any out-of-balance current taken exceeds either 100 A or 15 per cent. of the full-load phase current, whichever is the smaller. Here a negative phase-sequence relay, together with a short-time delay relay, is found to provide the ideal method of protection.

Negative phase-sequence relays operating on the phase-balance principle have been developed primarily for the protection of polyphase induction motors in essential services. The average starting current of a direct started induction motor may be of the order of 300 to 700 per cent. or more of the normal full-load current and may last for several seconds while the machine is accelerating. The protection of such a machine by thermal trip devices or electro-magnetic over-current relays with dashpots would be satisfactory, but such devices do not always afford protection against single-phase running, short-circuits or machine-earth faults. With motors taking more than a few seconds to run up to speed, unless high-current and long-time settings of over-current relays are chosen, unwanted tripping of the machine will occur at starting; at the same time these high settings are such that inadequate protection is afforded to the motor under fault conditions.

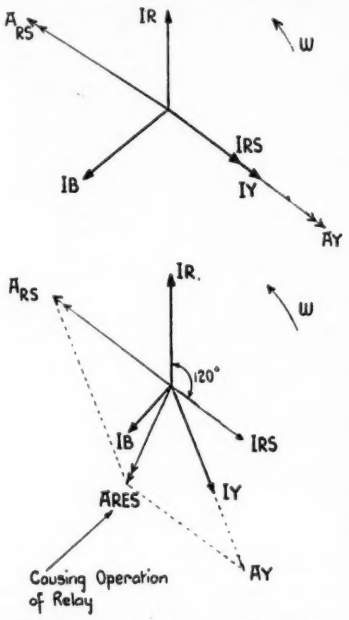


Fig. 3.—Vector diagrams illustrating the operation of the relay, the top being with balanced and the bottom with unbalanced three-phase load currents

In some cases over-current relays are rendered inoperative during the starting period, an instantaneous relay only being used for the purpose of short-circuit protection.

While such schemes possess certain doubtful advantages over the long-time and high-current combination, unnecessary complications are introduced by the use of auxiliary timing devices, &c.

Essentially, the four types of electrical faults against which any important motor should be protected are:—Internal and external short-circuits between phases, phase-to-earth faults, single-phase running and machine stalling. The first three former conditions result in unbalanced line currents which may be detected by the use of a suitable negative phase-sequence relay, while a stalling relay should be employed where the possibility of the latter fault occurring is prevalent.

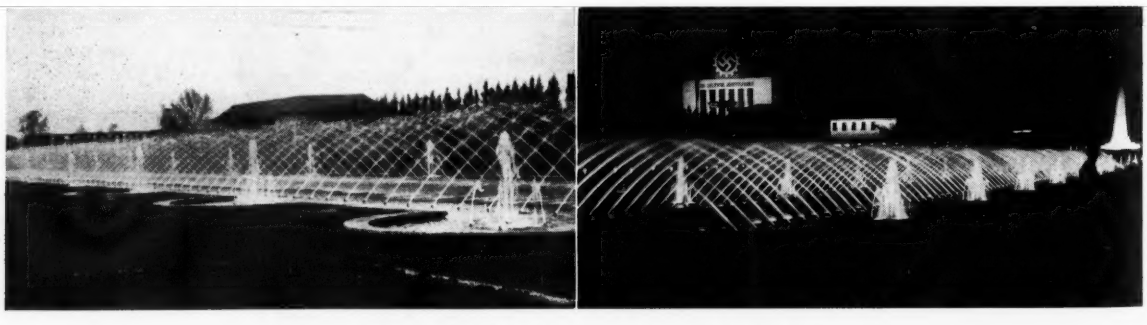
The phase-balance type of negative phase-sequence relay, therefore, gives comprehensive protection to polyphase motors of all types in vital services.

A German Lighting Display. By Hugh S. Allpress

THE Schaffendes Volk ("Working Nation") Exhibition at Düsseldorf recently closed, after being well in the news with the recent visits of Hitler, and, almost on the last day, of the Duke and Duchess of Windsor, who inspected the village of some 100 cottages specially erected for the exhibition. In view of the recent series of International Exhibtions—Brussels, Paris—and next our own Empire Exhibition at Glasgow in 1938, the exterior artistic and spectacular displays are of great interest, especially to the electrical engineer.

During the evening band concerts, the visitor was held spellbound when suddenly into the quiet sky broke the vivid splendour of the 130 ft. high fountain which played in a seemingly unending sequence of changes of shape and colour. Alongside the main Grand Boulevard of Flags to the "High Entrance" there was an avenue of waterfalls with floodlighted hedges and a remarkable archway of illuminated water jets which formed a fairy-like crystal palace in water, producing a wonderful spectacle, backed by the coloured fountain and strip-lighted pergolas in the distance.

The accompanying pictures show the effect by day and by night—when the view was crowned by the swastika sign on the floodlighted "Working Front" building which towered over all in the background. When comparing these photographs it will be seen at once how the art of the electrical illumination engineer can, at night time, transform an excellent but perhaps not outstanding water display into a really spectacular effect, which has drawn crowds, not only from Germany, but from all parts of Europe, crowds who probably would not otherwise have been attracted to a prosaic industrial exhibition, but, having come, were doubtless soon drawn towards the remarkable industrial exhibits to be seen on all sides.



Day and night views of the fountains at Düsseldorf

Welding in Building Construction

Regulations are to be made under Section 9 (2) of the London Building (Amendment) Act, 1935, modifying by-laws so as to permit the use of electric (metal) arc welding. The new regulations (49 in number) relate to the mechanical construction and properties of the welds, but it is laid down that the electrodes must comply with the requirements for Class A in B.S.S. 639—1935.

Electricity in a New Liner

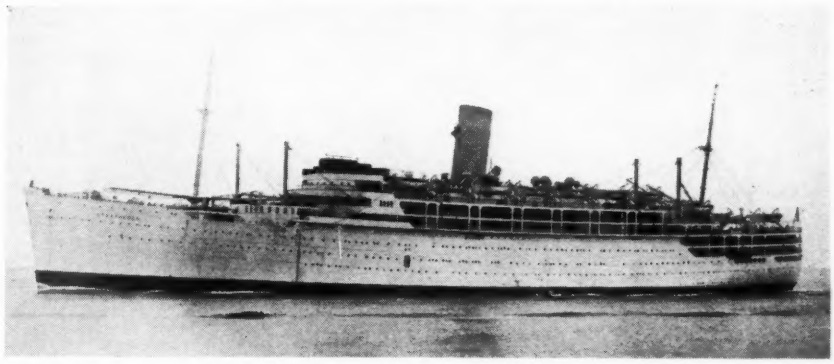
The s.s. "Stratheden"

A 1,650-kW generating plant serves the auxiliaries and "hotel" services of this new P. & O. vessel

THE twin-screw turbine liner *Stratheden*, the latest addition to the fleet of the Peninsular & Oriental Steam Navigation Co., Ltd., starts to-day for Australia on her maiden voyage. The vessel has a gross tonnage of 24,000, an overall length of 665 ft., and a breadth of 84 ft.; she accommodates 488 first-class and 563 tourist passengers and is manned by a crew of 563.

Although the ship is not electrically propelled (the screws are driven through single-reduction gearing by Parsons turbines which develop 24,000 s.h.p. at 21 knots) the electrical requirements, namely, for engine-room auxiliaries, deck machinery and hotel services, are extensive. Energy is obtained for these purposes from three B.T.H. 550-kW 220-V compound-wound d.c. generators driven at 900 r.p.m. through single-reduction double-helical gearing by 5,000-r.p.m. turbines fitted with cam-operated nozzle control. These take steam at 380 lb. and 700 deg. at their stop valves from the main Babcock & Wilcox boilers, but the condensers, with air ejectors, closed feed system and motor driven 19-h.p. circulating and 4½-h.p. extraction pumps are individual to the generating sets.

The main switchboard of ebony "Sindanyo" panels by Whipp & Bourne, Ltd., is in three sections. Current is sent out to fourteen auxiliary boards; circuits exceeding 125 A in capacity are controlled by d.p. breakers, others by d.p. tandem switches and fuses. Instantaneous relays, operating at a predetermined overload on the generators, trip out feeders of secondary importance in emergency.



The "Stratheden," which sails for Australia to-day

Among the electrically driven auxiliaries in the engine and boiler rooms are those used in connection with the Weir closed-feed system (which includes condensers, feed heaters, air ejectors and extraction pumps), evaporators, and oil-fuel transfer and pressure pumps. Other important electrical drives are those for nine Drysdale centrifugal pumps for bilge, fire and other services, and five Howden forced-draught fans. There are also two Allen 7-in. salt-water circulating pumps (16,000 gal.) driven by 15-h.p. and 8-h.p. B.T.H. motors and a 2-in. circulating brine pump (2,500 gal.) driven by a ¾-h.p. Allen motor; these are all variable speed units.

Capstans of Clarke Chapman & Co.'s make are installed and there are twenty-four winches by Laurence, Scott and Electromotors, Ltd. The latter are capable of handling general cargo of 3 or 4 tons. The B.T.H. Co. was responsible for two bollard winches driven by 6-h.p. motors and nineteen 12½-h.p. and four 15-h.p. motors for operating the lifeboat winches.

For the refrigerating plant, J. & E. Hall, Ltd., have supplied four CO_2 compressors driven by 125-h.p. open-type motors with variable speed regulation from 320 to 160 r.p.m., two horizontal sea-water circulating pumps with 15-h.p. drip-proof motors (1,250 to 625 r.p.m.), five horizontal brine pumps with 8-h.p. drip-proof motors (1,150 to 575 r.p.m.), and nine cargo and one provision-chamber fans with motors of from 1 to 6 h.p. The electrical equipment for these was manufactured by the B.T.H. Co., and that for fourteen automatic ¾ to 3-h.p. methyl-chloride refrigerating sets by the G.E.C. A horizontal pump with c.i. casing is installed for dealing with up to 112 g.p.m. of slightly brackish refrigerating water in connection with the Carrier air conditioning plant; this pump with its 5¾-h.p. 1,100-1,590 r.p.m. motor and control gear was supplied by W. H. Allen Sons & Co., Ltd.

Electric heating of the cabins and staterooms is by Veritys convectors in stainless steel cases with "Chromalox" elements, and in the public rooms similar radiators are built into the panelling. Of the same make are the electric motors installed in connection with the "Thermotank" ventilating system.

The G.E.C. electrical equipment in the galley includes a fourteen-oven island range, a three-pan fish fryer, three grills and a double-deck bread oven. The same company undertook the lighting of many of the public rooms and principal staterooms, of which a good example is seen in the first class dining saloon, where a two-tier central fitting, 5 ft. in diameter, finished in matt silver and glazed with pink flashed opal glass, is matched by twelve similarly finished oval fittings on the surrounding cornice. On the port and starboard outboard portions of the saloon eight 13-ft. and four 9-ft. lighting units are fitted on the main longitudinal beams. Wall lighting consists of fourteen brackets, each accommodating Osram 12-in. architectural lamps. "Gecoray" reflectors in cast-brass brackets provide curtain illumination behind the grilles which cover the portholes.

In the vice-regal and de luxe suites a decorative scheme is carried out by dish fittings of from 9¾ to 30 in. in diameter on walls and ceilings. For cabin and corridor lighting about 3,400 Roanoid fittings were supplied and in the crew's quarters 700 water-tight guarded well-glass fittings. For cargo handling there are twelve "Neptune" lanterns and twelve eight-light clusters, and for boat launching twelve lanterns. Decorative lighting fittings were also installed by Osler & Faraday in other parts of the ship. A 20-in. Suez Canal searchlight projector has been provided by Clarke, Chapman & Co., Ltd.

A G.E.C. telephone operated in conjunction with a 400-line switchboard is in every first-class cabin and alarm indicators placed at thirty points show on the bridge the origin of the alarm. Three systems of intercommunication between the principal officers' quarters and between the chief electrician's office and all switchboards were installed by the Telephone Manufacturing Co., Ltd.

From a "Richaudio" smoke detecting cabinet in the wheel house ¾-in pipes run to every cargo space. If the air drawn through the pipes by duplicate electrically driven fans contains smoke the output of a photo-electric cell drops, operating a relay to sound a bell. An officer can follow the movements of the rudder and of the engines when manœuvring from any part of the bridge by means of a dual face Graham indicator, a single-face replica of which is in the engine room. An integrating repeater in the chart room enables a record of engine revolutions to be kept. Communication between navigational and control positions is provided by "Triton" loud-speaking telephones (also by Alfred Graham & Co.), all instruments in noisy positions being of the "din-proof" type.

Current for low-voltage communications is taken from two 12-cell 85-Ah (ten-hour discharge) "Exide-Ironclad" batteries. Rubber insulated and fire-resisting cables for the vessel were supplied by W. T. Glover & Co., Ltd.

Lloyd's Register Scholarship

The General Committee of Lloyd's Register of Shipping offers a scholarship, valued at £100 per annum and tenable for three years, to be awarded on the results of the Studentship Examination of the Institute of Marine Engineers in May next. The intention is to assist students to take an advanced course of instruction in engineering. The age limits are eighteen years to twenty-three years. The closing date for entries is April 16th, 1938. Particulars may be obtained from the secretary of the Institute, 85, The Minories, London, E.C.3. A candidate for the studentship who wishes also to compete for the scholarship must complete entrance forms for both purposes by the dates specified.

Work in Progress

A year-end survey of orders going through the shops of two leading electrical manufacturers

British Thomson-Houston Co.

BEGINNING at the turbine end of B.T.H. productions in hand, the largest unit is a fourth 75,000-kW set for Barking, followed by one of 60,000 kW for the Kent Power Co., 50,000 kW for Ironbridge and 25,000 kW for the Glasgow Transport Department. A second 30,000-kW extraction turbine (designed for 1,200 lb. per sq. in. and 900 deg. F.) is under construction for the Ford Motor Co. at Dagenham. From America there is an order for a 10,000-kW, 3,600-r.p.m., superimposed machine for the Detroit Edison Co.; this will operate at an initial steam pressure of 815 lb. per sq. in., 900 deg. F., and will exhaust into the existing steam range at 410 lb. Other work for home and abroad includes turbo-alternators up to 15,000 kW, turbine-driven exhausters with capacities up to 1.5 million cu. ft. per hr. and gas boosters up to 2 million cu. ft.

Tests have been successfully carried out up to 1,500,000 kVA at 33 kV on the H type circuit-breaker, which uses little oil. Explosion chambers are being employed for high rupturing capacities down to 3.3 kV, and the single-break principle up to 66 kV. For 132-kV an interrupting time of six cycles measured from tripping impulse to rupture has been achieved. Other newcomers are horizontal draw-out gear for 150,000 and 250,000 kVA up to 11-kV, air circuit-breakers making and breaking peak currents upwards of 50,000 A using contactors instead of carbon arcing contacts, and 660-V fused air circuit-breakers. Five transformers are under construction for the C.E.B., ranging from 10,000 to 30,000 kVA; eighteen of 10,000 kVA and over for supply undertakings go up to 40,000 kVA (Brighton). Most of these are fitted with "on-load" tap-changing gear. Among a number of transformers for steel works is one of 4,000 kVA for a 16-ton arc furnace on the N.E. Coast. The transformer development section is now equipped with an impulse generator reactor current surge oscillogram and calculating board. Two orders are in hand for transformers filled with "Permitol," a non-inflammable liquid dielectric. The demand for reactors of both the cast-in-concrete and oil-immersed types and up to 7,170 kVA at 33 kV is greater than ever.

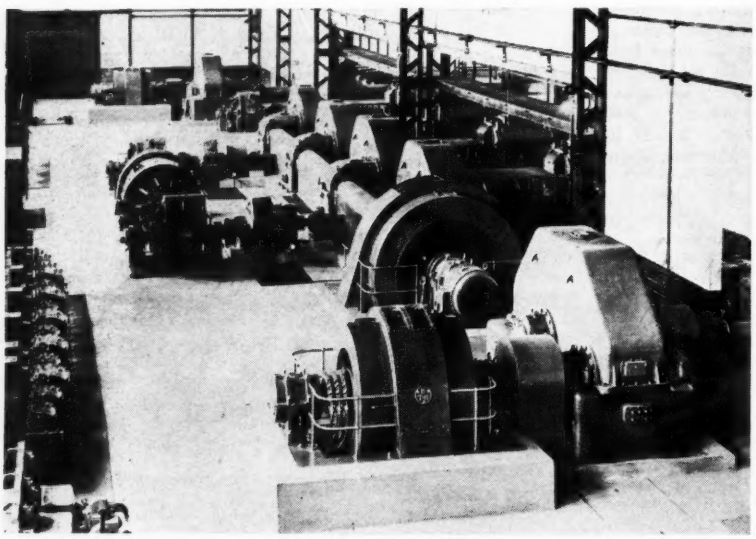
For the sister-ship to the *Queen Mary* the company has again received the order for the electrical generating plant—four 2,200-kW 220-V d.c. geared turbo-generators with combined condensers—as well as for a number of smaller vessels.

One of the orders placed by the London Passenger Transport Board (over £1,000,000) covered control and auxiliary equipment for more than 800 motor coaches and the wiring of trailer coaches. Nineteen four-motor equipments are in hand for the Wirral electrification (L.M.S.), nineteen two-car train units supplied in 1920 are being modernised for use in the new South Shields scheme (L.N.E.R.), and 123 further high-speed circuit-breakers are required for the extensions to the S.R. electrification.

Automatic sectionalising switches of a new type are being made for tramway and trolley bus systems in London and elsewhere; complete trolley bus electrical equipments are going through the shops for Johannesburg, Walsall and Wolverhampton, and motors and foot-operated contactors for 66 Sunbeam battery vehicles. A 600-kW rectifier for supplying trolley buses in Newcastle will be the first in this country to be provided with a resistance loading for preventing a rise of system voltage during regeneration by a bus.

Large winders for South Africa driven on the Ward-Leonard Ilgner system by 2,938-h.p. motors furnish the most conspicuous of several examples of heavy industrial engineering, but there are a number of rolling mill motors that rival them.

The most spectacular results of research, the company states, are to be found in street lighting and television, but steady progress has also been made in insulation, sound reproduction and refrigeration, to name only a few of its widely varied activities.

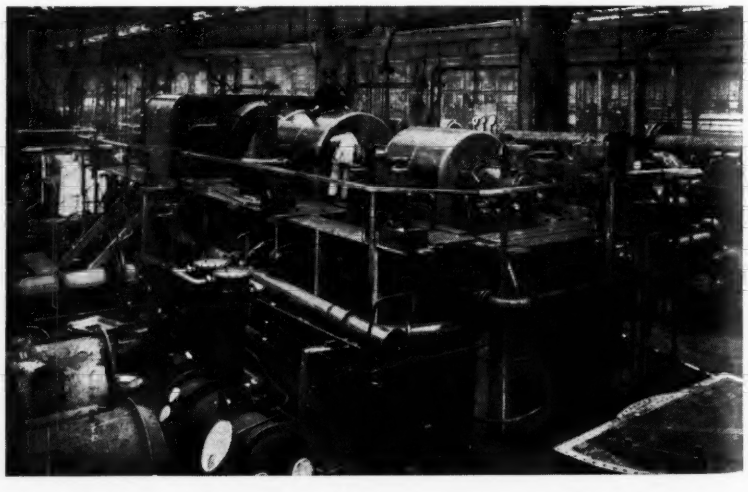


A recent B.T.H. job: Plant at Stewart & Lloyds' Corby works comprising a 4,500-h.p. synchronous induction motor, driving a continuous billet mill; a 2,000-h.p. slip-ring motor for a tandem billet mill, and motors and motor-generators for edging stands

C. A. Parsons & Co.

Great activity is reported in all departments of C. A. Parsons & Co., Ltd., and orders for upwards of 400,000 kW of turbine plant are in hand. These include the remaining two 40,000-kW, 33-kV sets, running at 3,000 r.p.m., for the new Table Bay power station (South Africa) and two 50,000-kW (also 3,000 r.p.m.) for the Bunnerong station, N.S.W.; the turbines will have three cylinders in tandem. In addition to the second 50,000-kW, 1,500-r.p.m., 20-kV turbo-alternator for Dalmarnock, there is a fourth re-heat set destined for Dunston B.

Among the 30,000-kW, 3,000-r.p.m. turbo-alternators being built are two for Calcutta and one each for Congella (South Africa) and Leicester, all designed for 33 kV generation, two for the Kent Power Co. and one for Hackney. The Congella turbine has a single cylinder with duplex exhaust



A 20,000-kW Parsons set, 4,600/13,800-V, three-phase, 3,600-r.p.m. for the Ford Motor Co. of Canada

Meetings and Discussions

An informative commentary on the electricity regulations under the Factories Acts was given to the A.S.E.E. this week by Mr. H. W. Swann, Electrical Inspector of Factories, from his experience of their operation. The London Technical Group of the E.P.E.A. heard a paper last week on earth leakage protection by Mr. H. G. Taylor; the rural aspect was particularly stressed. The discussion on the education and training of engineers at the I.E.E. showed that there was by no means unanimity as to either requirements or methods.

Electricity Regulations in Factories

IN a lecture to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on December 21st Mr. H. W. Swann (Electrical Inspector of Factories) discussed the Home Office Electricity Regulations in their bearing on present-day problems.

Regarding Regulation 1 he said that question of competence and experience was inevitably associated with maintenance, and the performance of apparatus must, as a rule, be determined by test before its sufficiency in size and power could be assured. He drew especial attention to the importance of the mechanical protection of conductors (Reg. 2) and of the design of the fuse link (Reg. 3), the operational characteristics of which (*i.e.*, the prevention of accident resulting from scattering) often depended on design and test.

Under Reg. 7, the unfortunately common mistake of inserting single-pole switches in the neutral conductor and its consequences were discussed, and the lecturer paid special attention to excess current protection called for by Reg. 8. He stressed the importance of relating the setting of over-current devices to the resistance of earth return circuits, and related this to the fire risk.

Under Reg. 13 the physical aspect of electric shock was explained and the special risks associated with the use of portable apparatus enumerated. The switchboard regulations, both for medium and high voltages, as applicable to factories, were dealt with collectively, but the lecturer devoted special attention to the requirements for earthing which appear in Reg. 21. He stressed the importance of measurement, and described the conditions under which direct earthing should be supplemented by sensitive earth-leakage circuit-breakers. In connection with the latter he discussed the effect of chance earthing of conduit and cable sheathing, and some of the arguments for and against multiple earthing of neutral conductors on factory premises.

The Registration of Engineers

UNDER the title "The Engineer and the Community," Professor F. E. W. Hackett, president of the ENGINEERS' ASSOCIATION (Dublin) reviewed the position of the engineer in modern civilisation and cognate matters in his presidential address on December 17th. Professor Hackett quoted the Tennessee Valley Authority scheme as a remarkable example of the pressure produced by the application of engineering science on the social, economic and political organisation of a country, and said that it was still more remarkable that such a public works administration had been established in the land of trusts, big business and public utility companies.

From this he passed on to the Shannon electricity scheme—an example of the engineer's influence upon the life of the community in the Irish Free State, and then proceeded to refer to the purposes of the Association. He said that it was formed originally to organise Irish engineers to meet the influx of foreign technicians. Now it aimed at placing engineering on a truly professional basis by a system of registration. Prof. Hackett said that legal status had been given to the profession in many countries with widely different conditions. It was possible for engineers to gain a large measure of public recognition through the efforts of professional institutions. This would have to be the case in Ireland for there was no indication that any Irish Government would be persuaded to take any great stride in the matter.

The training of engineers was next considered by the speaker. He said that there was a condition bordering on overcrowding in their engineering schools at present, and the fear had been expressed that there would be a surplus of civil engineers by 1940. Nevertheless, there was a shortage of electrical and mechanical engineers due, perhaps, to the long training period. There should be an endeavour to foresee the demand for definite types of specialists and arrange for the number of students to be in accordance with this.

Professor Hackett added his plea to that of other educationalists that the training of engineers should not be a narrow one, but should fit them for taking their full share in the solution of the complex problems of modern life.

Earthing on L.v. Systems

IN a paper presented to the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION, on December 14th, Mr. H. G. Taylor referred to the modern conception of earthing, which, unlike the earlier idea, did not assume that a conductor connected to earth was necessarily at earth potential but that its potential above earth was equal to the product of the fault current and the resistance of the earth electrode. In order to limit the potential to a safe value, the resistance should be low and related to the permissible fault current as determined by the fuses or the setting of the protective gear.

The resistance of the earth electrode was almost always that of the soil between the surface of the electrode and a point some distance away beyond which no appreciable increase of resistance occurred. A small contact resistance might be introduced by defective installation, but that was unusual. The resistance of an electrode was determined by the resistivity of the soil and the shape and size of the metal. A low resistance could be obtained by distributing the electrode over a wide area. A number of plates in close proximity was inefficient, and strip electrodes should be buried in straight lines or in a number of lines radiating from a point. The length of pipes was more important than their cross section.

The best method of measuring earth-electrode resistance was to use one current and one potential electrode. A.c. was passed between the electrode to be measured and the auxiliary current electrode and the potential between the main electrode and the second auxiliary electrode was applied to the pressure coils of an ohmmeter, the current coil of which carried the testing current. A similar test could be made by means of an ammeter and voltmeter.

In rural areas where no water mains existed and where the supply was overhead, owing to the high resistivity of the soil it would not be economic to install an electrode with a sufficiently low resistance to blow the largest fuse in the installation. In tests made by the Electrical Research Association in a number of villages on 64 per cent. of consumers' installations a 5-A fuse and on 88 per cent. a 30-A fuse could not be blown in one minute. This difficulty could be overcome by protective multiple earthing, in which the frameworks of all the appliances in the house were connected to the neutral at the meter-board and by earth-leakage circuit-breakers.

By the former method a low resistance was provided for the fault current, which then was large enough to blow the fuse. In the second method the circuit-breaker was provided with a trip coil connected between the metal-work and earth and operated when the voltage on the appliance exceeded a

Work in Progress *(Concluded from previous page)*

(as at Hull). A 25,000-kW set has been ordered by Rotherham Corporation and single cylinder sets to develop 15,000 kW at 3,600 r.p.m. by the Western Canadian cities of Edmonton and Regina. Geared units of from 1,250 to 5,000 kW are in demand for India and the Dominions.

Among several industrial turbo-generators passing out steam at one or more pressures is a 20,000-kW unit for Canada. Turbo-blowers, compressors and pumps for home and foreign service are also conspicuous items in the company's erection shops.

In addition to the manufacture of generators, the electrical department has been occupied with a number of special machines such as a 25,000-kVA synchronous condenser and a 25-50-cycle asynchronous-synchronous frequency changer of the same capacity for a power station in New South Wales.

An extension of the transformer shops has been made to cope with an increasing demand for transformers of all sizes, and automatic tap-changing voltage regulators. Several heavy current transformers are also being made here for electric furnaces. The welding department is doing a considerable amount of work for outside customers, in addition to meeting the company's own requirements. Improved prosperity in shipping is indicated by the number of split refractors of parabolic-elliptical formation ordered for navigating the Suez Canal.

A plant has recently been put down for producing highly reflecting films by the evaporation of the metal in high vacuum. Telescopes of all kinds up to one of 74-in. aperture for Pretoria are the main activity of Sir Howard Grubb, Parsons & Co., an associated concern.

safe value. In Dumfriesshire all the switches had been effective in cutting off direct faults, 30 per cent. at 30 V or less, 50 per cent. at not more than 40 V, a further 40 per cent. at between 40 and 85 V and the remaining 10 per cent. at below 210 V. By adjustment on site, two of the four operating between 85 and 210 V were brought down to 85 and 75 V.

Breakage of the neutral inside the house was overcome by connecting the metal framework to the neutral only at the meterboard. Fracture of the neutral service conductor was still less likely and the resultant voltage rise on the metal-work in the consumers' installation varied with the resistance of the earth electrode at the installation and the connected load

Nagoya Palace floodlighted **(see page 905)**

at the time of rupture. To guard against fracture of the distributor neutral protective multiple earthing should be used only if the distributors were 0.05 sq. in. or larger.

The Electrical Research Association, the author concluded, recommended that protective multiple earthing should be permitted, subject to certain conditions and that ordinary earthing should be used in domestic installations only if it could be relied upon to afford protection. It had also been suggested that a British Standard Specification should be prepared for circuit-breakers, and that work had commenced.

Replying to points raised in the subsequent discussion, Mr. Taylor agreed that some form of earth-leakage protection could be usefully applied to installations of large consumers in urban areas. The British Standards Institution was dealing with the question of the effect on the system of earthing the neutral through wireless sets. Tests during five years showed that the reduction in resistance of an earth electrode due to the use of coke depended on the amount of coke used, but the percentage reduction remained the same whatever the type of soil. The use of coke also reduced the seasonal variation of resistance and increased the loading capacity. Its disadvantages were its cost, the larger hole needed in which the coke had to be rammed after inserting the electrode, and corrosion of the electrode and connections in the coke.

The pipe should be driven to secure the best contact. Any shrinking of the soil away from the pipe would be confined to a few feet from the surface in a depth of 6 ft. He advocated burying earth plates vertically because one could not be sure of a good earth contact on the under side of a horizontal plate. Single point earthing could be carried out at other places on the system than in a sub-station, but in at least one large town in the Midlands the earthing of installations to water pipes had been forbidden.

Engineering Education

IN introducing the general discussion on "Electrical Engineering Education," which was opened at the INSTITUTION OF ELECTRICAL ENGINEERS on December 16th by three papers (reported in our last issue) by Prof. C. L. Fortescue, Col. H. Fraser, and Mr. F. H. Clough, the President (Sir George Lee) defined its scope as relating to those whose ultimate aim was to become corporate members of the Institution. The problem as he saw it was whether the engineer should be trained merely to earn his living or to have a wider outlook. He said that Col. Fraser was unfortunately unable to be present and that he was represented by Mr. E. S. Byng.

Dr. A. P. M. Fleming remarked that the problem was twofold: first, to secure the best recruits to the industry, and, secondly, to use every means—including many not yet used—to educate them thoroughly. In his view neither of these two requirements were met to-day. Those responsible for general education were rather remote from industry, but that could be rectified. Universities could deal with the humanities and cultural aspects and fundamental and applied science bearing on practical engineering, but industry should undertake some of the technical instruction now carried out in technical schools, or, alternatively, manufacturing specialists should teach for part of their time in such institutions. Something might also be done to teach the future teacher.

Industry should consider unified action in dealing with education and training instead of each firm looking after its own interests. The fullest possible account should be taken of the latent possibilities of every recruit, irrespective of his social background or educational level, particularly those from levels much lower than those referred to in the three papers.

Dr. F. T. Chapman urged the Council to consider the formation of an Education Section or Group as the Institution of Mechanical Engineers and the Institute of Marine Engineers had done. For the majority of boys there was much in favour of the part-time system of education. He disagreed with Prof. Fortescue in his implication that the student should not be taught responsibility until he reached the age of twenty-four; such training should be gradual from a very early stage.

Dr. C. C. Paterson advocated a thorough training in fundamentals, especially in physics or chemistry, with engineering specialisation later. The university was not, perhaps, the most suitable ground for character training, because it was done by precept, whereas example was everything.

Prof. E. W. Marchant pointed to the impossibility of covering, in a college course, the whole range of engineering as could be done forty years ago. This entailed specialisation in order to keep knowledge of modern fundamental principles of electrical engineering in the forefront. The ideal course of training would include a day period at a college where the student came into touch with those in other professional branches and thus broadened his interests far more than if he went in specifically for vocational training. At Liverpool University £120,000 had been spent on recreational amenities.

Mr. F. Gill hoped the Council would either follow up Dr. Chapman's suggestion or in some other way would try to make industry more articulate as to what it wanted from the colleges. He advocated the teaching of design or engineering planning in its three aspects of requirements, alternative plans for meeting these requirements, and selection among these alternative plans. By this means common-sense views could be taught about true cost. An eminent engineer used to train his men by putting three questions in relation to a problem: Why do anything? Why do it now? Why do it that way? If this method was adopted in engineering education very few half-baked schemes would get through to the end.

Mr. E. B. Moullin deprecated the idea that education was simply a means of enhancing a man's capacity to earn his living. Engineering education should take account not only of what a man would be required to do to-morrow, but what he would have to comprehend in a senior position twenty years hence.

Mr. W. E. Highfield expressed the view that education in this country to-day, though sound, was deficient in two respects. First, there was very little liaison between general and technical education, and, secondly, there was no link between the educational authorities and employers and the public. For instance, a National Certificate in engineering was of little use to a student if his prospective employer did not know what it implied.

Dr. L. G. A. Sims welcomed the efforts of Dr. Fleming and his company to enable teachers to maintain contact with industry, for nothing was more likely to stimulate the essential enthusiasm in students than examples from industrial testing rooms.

Sir Noel Ashbridge said that on inquiring of technically trained students what branch they would prefer, the unhesitating answer of at least 60 per cent. was research. Research was regarded as the least boring of any departments. The majority of the remainder did not know what department they wanted to go into, and often did not know what went on inside them. In time, perhaps, the engineering educational establishment would become, as in the case of hospitals, combined in one organisation with the works.

Prof. W. Cramp said his approach to the subject differed from anything expressed in the three papers, between which there were also some deep-seated differences. Birmingham had always taken a wider view than Prof. Fortescue envisaged, and therefore a student could not get his first degree there—even an ordinary degree—in less than four years from matriculation. This gave time for workshop study within the University walls and for a broader basis of fundamental work. Also, the work of the final year need not be limited to a particular branch of the profession as Prof. Fortescue thought necessary; this was an important matter of principle, for few men knew into what branch of the industry they might enter or ultimately drift into. In his view, specialisation should be no part of a degree course—a fundamental difference between

himself and Prof. Fortescue. Again, in the matter of practical training no university could teach production and costs except in barest outline. He regarded the scheme suggested in the appendices to Prof. Fortescue's paper as too narrow and vocational. He hoped, however, that no semblance of uniformity in curricula would appear in syllabuses of different universities. After remarking that ability to master uncongenial subjects was one of the foundations of character, Prof. Cramp said that many of the suggestions made by Mr. Clough had already proved successful in Birmingham.

Mr. L. W. Phillips remarked that a closer relationship between education and industry would result in an inflow of the ideals of education into industry. Some relationship between works and ordinary schools was also required so that boys could judge the kind of profession they would like to enter. Prof. R. O. Kapp deprecated Mr. Clough's suggestion that reference books should be taken into the examination room, as this would, he said, make the latter something like an office, but the same conditions could not be reproduced.

The authors agreed to send in their replies in writing.

Marine Propulsion

A PAPER on the "Transatlantic Liner of the Future" was read by Messrs. A. C. Hardy and P. de Maulglaive before the INSTITUTE OF MARINE ENGINEERS at a meeting on December 14th.

Airway competition, the authors say, must be met by providing 1,350-ft. vessels capable of making 37 knots, and economy in space calls for a turbo-electric drive with oil-fired boilers. The 400,000 s.h.p. required would be distributed over six screws, each driven by a 220-r.p.m. synchronous-induction motor.

Six 51,000-kW, 2,640-r.p.m. turbo-alternators would be installed, with 55,000 sq. ft. of condenser cooling surface giving a vacuum of 29 in. (bar. 30), each set being supplied with steam at 825 lb. per sq. in. (gauge) and 925 deg. F. for two 200,000 lb. per hr. fuel-valve boilers. In each of the six engine rooms there would also be an auxiliary 3,500-kW turbo-alternator taking steam from a fuel-valve boiler with an evaporative capacity of 50,000 lb. per hr. at 365 lb. per sq. in. and 700 deg. F., which would also generate steam required for general auxiliary purposes.

Two small heavy-oil engines would supply energy for starting up the auxiliary boilers when no steam was available for this purpose.

Fuel-oil consumption (18,000 B.th.u. per lb.) of the main units is estimated at 0.45 lb. per s.h.p. per hr., the overall figure being 0.5 lb. and the total amount 89 tons per hr. The authors point out that the power plant represents normal practice ashore.

A New Industrial Illuminant

ABOUT eighteen months ago the General Electric Co., Ltd., introduced its "Osira" fluorescent tubes for decorative lighting in such places as hotels, restaurants or showrooms. It later became evident that the quality of the light emitted made the tubes eminently suitable for certain industrial applications.

The requirements involved in the illumination of the gauge room of an engineering works presents a special problem. In any factory in which engineering products have to be turned out to very fine limits, in some cases reckoned in ten-thousandths of an inch, the standardisation and checking of production gauges are essential to the satisfactory performance of all other operations.

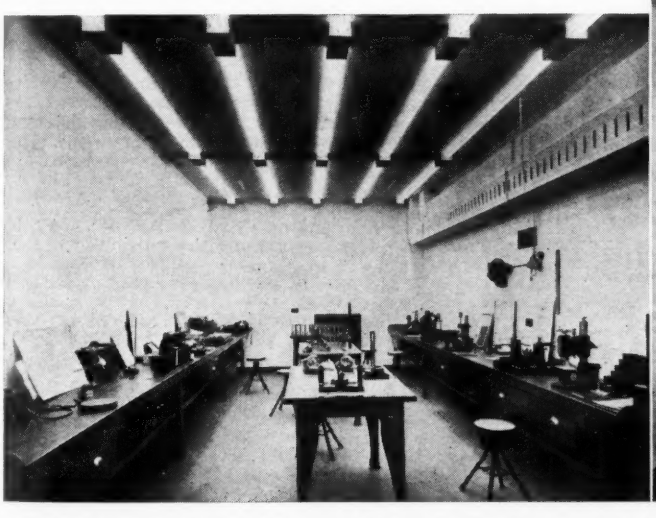
The sensitivity of the gauges to heat and cold means that the temperature of the gauge room must be kept at a constant level, a requirement which involves the total enclosure of the room with the consequent exclusion of all daylight. The system of lighting is, therefore, most important, and the lighting units must be so disposed that nowhere within even a quite considerable distance of the test gauges must any local "hot spot" be created.

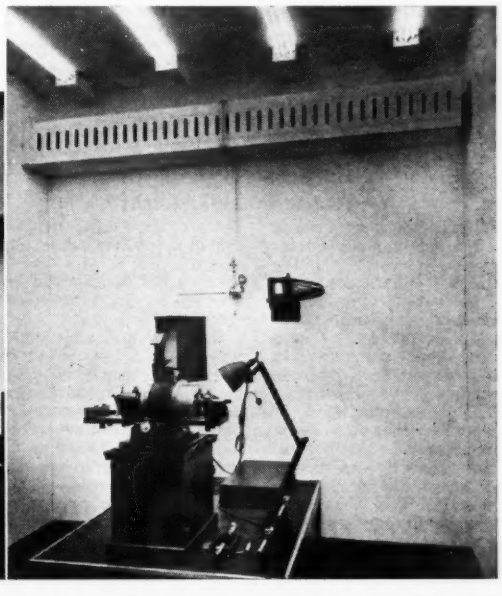
In order that the visual checking of gauges shall be carried out with the minimum of strain and the greatest reliability it is necessary to provide illumination of high intensity and great diffusion to avoid harsh shadows. The psychological effect upon the worker is another important factor.

It is claimed that "Osira" fluorescent tubes meet all these requirements. Their low surface brightness enables them to be spread evenly over a large area of room to secure adequate diffusion of both light and heat, while by suitably choosing the colour combination of the tubes a resultant lighting effect closely approximating in psychological quality to sunlight is obtained.

A typical installation, in an aeroplane factory, is shown in the accompanying illustration. Preliminary tests indicated that an illumination intensity of the order of 30 ft.-candles was adequate for the work, while anything materially below this level increased the strain of vision. The installation was therefore planned to give this average illumination, and in practice the diffusion of the light was so even that the illumination readings taken in all parts of the room showed a maximum variation from 31 ft.-candles to 28 ft.-candles, while the "shadowlessness" was such that when an operator seated himself at the bench the illumination on the gauge he was examining only dropped from 30 ft.-candles to 29 ft.-candles.

Lighting by means of fluorescent tubes in the gauge room of an aeroplane factory. The right-hand picture shows the excellent definition and shadowless lighting which result





To obtain the right colour quality, a mixture of pink and blue-white tubes were combined in lines of three tubes, two white and one pink. Constancy of both illumination output and colour quality is obtained by the installation of chokes on the white tube circuits. In practice it is found that while the output of the pink tubes based on a neon discharge remains constant for very long periods, that of the white tubes tends to depreciate during life. For this reason the white tubes are arranged so that in the early stages of life they are deliberately underrun and a simply operated adjustable choke enables the current to be increased so that the total light output and colour balance can be kept constant throughout life. In order to ensure the elimination of all stroboscopic effect, adjacent lines of tubing are arranged on separate phases. The system has now been installed in several aeroplane factories.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

A.c. Motor Protection

The figures given by Mr. E. H. B. Martin in your issue of November 12th for the permissible duration of overloads of 100 per cent. may be applicable to naturally cooled motors but not to modern fan-cooled screen-protected machines. Taking, for example, a 55-h.p. four-pole slip-ring motor of the latter type, I have calculated that the total temperature (measured by thermometer) caused by a 100 per cent. overload for five minutes following a full load run (assuming an ambient-air temperature of 15 deg. C.) might reach 103 deg. on the inside of the coils. As the charring point of cotton is 100 deg. the insulation would be destroyed by even one such overload.

Even if the overload capacity is above that laid down in B.S.S. 168/1936, it is best to keep the overload within the specified limits to avoid deterioration of insulation due to its being frequently subjected to high temperatures. Mr. Martin's remarks regarding the heating of frequently started motors used for machine-tool drives are not applicable in normal cases, where starting periods of a few seconds occur only once in about four hours.

The settings which Mr. Martin recommends for overload releases are allowable only for specially built motors. I have had difficulty in finding starters at an economic price which have releases allowing the motor to develop 25 per cent. overload for anything like two hours.

With regard to his query as to the ambient-air temperature compensator, ordinary thermal overload releases operate by deflecting a bi-metal strip through a distance approximately proportional to the change in temperature and hence to the square of current flowing. In that case, a motor operating in a warm atmosphere may trip earlier than is necessary, due to the smaller deflection necessary for effecting release as a result of the large initial deflection. Ambient temperature compensation permits tripping only when the temperature of the motor approximates to the safe maximum. In one make this is done by controlling the distance through which the trip bar is moved before release; this control is provided by a second non-electrically heated bi-metal strip which is deflected simultaneously with the electrically heated strip, but to a lesser degree.

The non-electrically heated compensating strip is of the same length as, but thicker than, the electrically heated strip. As the deflection of such bi-metal strips is inversely proportional to the thickness, the distance through which the trip bar moves before release at high ambient temperature is not so great as it would be if both strips were of the same thickness, but is greater than would be the case without compensation. In cold atmospheres, this distance is less than without compensation.

N. V. PESTEREFF.

Edinburgh, *December 19th*, 1937.

Motor Starting Regulations

Referring in your issue of December 17th to supply authorities' regulations regarding the starting of squirrel-cage motors, Mr. R. W. Towers states "little improvement seems noticeable." It is my experience that, far from there being any improvement, conditions are definitely worse to-day than they were even five years ago. The farcical character of many of the regulations is well emphasised by the two following recent experiences of my company.

One of the largest London supply authorities insisted that a 2-h.p., 415-V, three-phase, squirrel-cage motor, starting up on a loose pulley, must have a starter which limited the starting current to the value of the full-load running current, *i.e.*, 3 A. The second case concerned a firm which wished to install a 4-h.p., 415-V, three-phase motor and was told by the supply undertaking's representative that a slip-ring motor was essential as he doubted if a squirrel-cage machine could be supplied with a starting current to comply with his authority's regulation, namely, not to exceed the full-load running current, 6¼ A. In both cases the consumers were factory owners whose premises were adjacent to large housing estates where the supply authorities were almost "going on their knees" to induce householders to install cookers, which frequently take fairly heavy currents when switched on, and, being on single phase, are a potential source of out-of-balance load.

Conditions as regards single-phase motors are even worse: in fact they are so bad in certain London districts that several of the most reputable manufacturers refuse to quote for motors if they know they are intended for installation in these districts.

I wonder if those responsible for the framing of the offending regulations realise what a valuable weapon they are forging for the use of the gas and oil industries?

W. E. LAWTON, *Managing Director.*
INDUSTRIAL ELECTRICAL CO., LTD.

London, N.1, *December 20th.*

In the Courts

Two-part Tariff Attacked

In the Chancery Division last week, Mr. Justice Bennett had before him a procedure summons in a pending action brought by the Attorney-General (at the relation of Mr. Charles H. Stevens, Wimbledon) for the purpose of testing the validity of the two-part tariff method adopted by the Wimbledon Corporation of charging for electricity.

Mr. Evershed, K.C., stated that the plaintiff alleged that the tariff in question was *ultra vires* and invalid on the ground that it created inequalities and undue preference between consumers in the area. Under the Electric Lighting Acts Mr. Stevens was entitled to a supply on the same terms as those on which other consumers in similar circumstances were given a corresponding supply and his complaint was that he had been assessed at a different annual charge from occupiers of houses similar in type and had been overcharged.

Counsel said that in its defence the Corporation denied undue preference and said that if it had assessed other houses of similar type and size at a lower annual fixed charge the supply given to such houses or any of them was not a supply corresponding to that given to Mr. Stevens's house nor one given in similar circumstances. The Corporation was ordered to give particulars of the supply to other houses of similar size and type which were subjected to lower charges and in what respects the supply and circumstances were dissimilar. In reply the Corporation said that the conditions of supply were governed by the electrical demand and that there was no similar house in the area because no other house had a similar electrical demand. He (Mr. Evershed) contended that the "particulars" furnished by the defendants did not comply with the order and he asked that that part of the defence should be struck out.

Sir Lynden Macassey, K.C., argued that the defendants were entitled to vary their charges as they pleased within the maximum allowed by the Acts so long as persons whose circumstances were similar were supplied at the same rate. He submitted that the "particulars" given were sufficient.

At the conclusion of the arguments his Lordship held that the Corporation had failed to comply with the order for particulars and directed that that portion of one of the paragraphs of the defence should be struck out. He directed that the costs should be the plaintiff's costs in the action in any event. He gave the Corporation leave to appeal from his decision.

Compulsory Winding-up

In the Companies' Court on Monday last Mr. Justice Simonds had before him a petition for the winding up of the Goldhawk Electric Co., Ltd., Western Avenue, London, W., the petition being presented by the St. Helens Cable & Rubber Co., Ltd., judgment creditors.

Counsel stated that the petitioners' debt was £161. The company did not appear and his Lordship made the usual compulsory order.

Radio Patent Action Judgment

In the Chancery Division on Tuesday Mr. Justice Luxmoore delivered judgment (having reserved it since January 17th) in the action brought by the British Thomson-Houston Co., Ltd., Marconi's Wireless Telegraph Co., Ltd., and Electric & Musical Industries, Ltd., against Guildford Radio Stores (of Guildford, Surrey) and E. K. Cole, Ltd., for an injunction (and the usual ancillary relief in a patent action) to restrain the defendants from infringing the plaintiffs' letters patent No. 248731 of 1925, and granted to the first-named plaintiffs for an invention for "Improvements in Thermionic Valve-amplifying Systems," for use in connection with radio receiving apparatus. The other plaintiffs were tenants-in-common in the patent.

The defence was a denial of the alleged infringement and pleas that the plaintiffs' letters patent were invalid by reason of prior publication and prior common general knowledge. After a trial lasting several days his Lordship reserved judgment.

After dealing at length with the claims and the expert evidence given at the trial he held that the plaintiffs' invention had not been anticipated and that their patent was valid and gave judgment for them for the injunction claimed and ordered an inquiry as to damages.

The operation of the injunction granted was stayed pending an appeal by the defendants to the Court of Appeal on terms.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Domestic Washer

The Model 230 electric washer of APEX-VACTRIC, LTD., has the "Double Dasher" agitator and replaces former Model 200. It has a white porcelain enamel tub, making the whole range of Apex - Vactric washers a white line. The new base is much heavier than the single step base it replaces, making for strength and durability.

The "Apex" Model 230 washing machine

The 13-gal. tub has washboard sides and a patented quick drain bottom. The cover is of the reversible tray type, finished in white, and the agitator is 10½ in. high and is made of cast aluminium. The legs are fitted with noiseless, easy rolling 2-in. rubber castors. An Apex-Vactric-Lovell electrically driven wringer is attached. It has a lever safety release and pressure selector. The rolls are 1⅞ in. in diameter and 12 in. long. A ¼-h.p. heavy-duty, waterproof motor operates the washer and wringer. Eight and a half feet of moisture-proof flex, with plug, is attached.

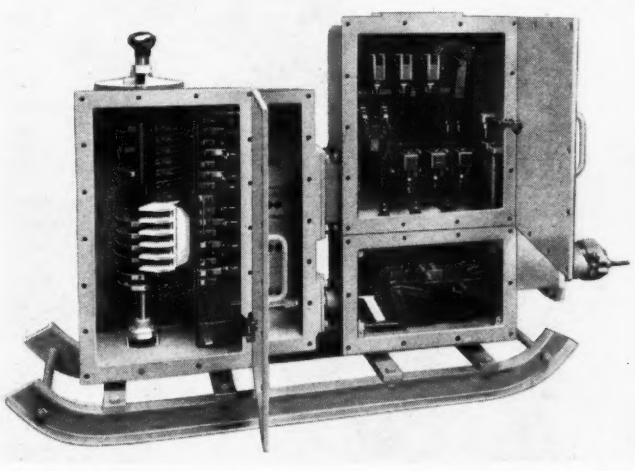
Small Convection Heaters

A range of portable "Thermovent" heaters is announced by E. K. COLE, LTD., Southend-on-Sea, who recently acquired Thermovent, Ltd. Eight models are available, in ratings of 1 and 2 kW at 200-220 and 230-250 V, with one design of casing for all.

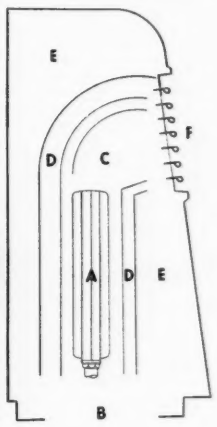
The standard type, P.1, has a single switch control on the front. PC.1 is similar, but is provided with a thermostat control. PL.1 has a luminous effect and switch control, and PCL.1 has a luminous effect and thermostat control. Four equivalent types for 2 kW are styled P.2, etc. Thermostatic control is for a.c. only but for d.c. external automatic control can be fitted.

Dimensions are 14 in. by 16¼ in. by 8½ in. for 1 kW types and 23½ in. by 16¼ in. by 8½ in. for the 2 kW—no more than those of ordinary electric fires.

The moulded casing is produced in alternative finishes of walnut or black, with copper fittings. The luminous types have glass louvres, reflecting a warm glow from a strip-lamp. Rubber-tipped feet keep the base of the heater off the floor and so provide a cool air inlet.



Cool air flows into the inlet (B) shown in the diagram and is warmed in contact with the completely enclosed ribbed heating element (A). It rises and is expelled at (F) *via* the main duct (C). The secondary duct (D) is the first, and the outer duct (E) the second stage of heat-insulation, so that the outer casing remains at about room temperature. The effect is to produce a stepped temperature gradient. Heat lost by radiation is negligible. The flow of air is 2,600 cu. ft. per hr. per kW with uniform heat distribution and absence of wall discoloration. The average temperature rise between inlet and outlet is 71 deg. F. The sole connection between the vents is at the bases—in the cool air stream, where the thermostat is fixed, so as to give accurate control of room temperature.



The Ekco convector and diagram showing the air currents

Instead of maintaining an absolutely level temperature, the thermostat provides a regular 6 deg. F. fluctuation for the purpose of keeping a "live" circulation of blood in the skin tissues. The cycle of fluctuation depends on size of room and amount of ventilation, but averages about one hour. The warming of the air continues for some considerable time after switching off, and savings of up to 70 per cent. in energy consumption are claimed.

Inset type Thermovents for flush-fitting into existing fireplaces or building into walls, and types for surface-fitting, are also available. In cases where a thermostat is fitted integral with the equipment an extra charge is made.

A Tube Cutter

For the rapid and smooth cutting of copper and brass tubes and conduit tubing FRY'S (LONDON), LTD., 24, King Street, London, E.1, have introduced the "Enox" tube cutter. It is fitted with a reamer blade which folds into the body of the cutter when not in use. The device measures only 3 in. by 5 in.

A Flameproof Haulage Unit

The "Belmos" flameproof haulage control unit recently introduced by the E. M. B. Co., LTD., West Bromwich, for use in mines consists essentially of two main parts, the controller and the circuit-breaker and isolating switch, mounted in their electrically welded steel-plate cases, side by side on a channel-iron skid carriage.

The large-diameter controller drum, with its cast-iron, mica-insulated sections clamped to the square mild-steel shaft, is easily withdrawn after the removal of the top-plate bolts. Intermediate positions are determined by a spring influence pawl and wheel. The pressed-steel channel finger lever and the brass section finger bracket make for a desirable combination of strength and lightness, and each finger can be removed independently of the connections.

The E.M.B.-Belmos flameproof haulage unit

On a pivoted arm the arc shields swing clear of the drum and fingers, and the rear of the terminal chamber accommodates sealing boxes and glands for outgoing cables. The upper compartment of the circuit-breaker contains the contactor and protecting devices, and the lower compartment houses the bus-bars and isolating switch. A roll and rub movement ensures long life for the contacts. The isolating switch is readily removable as a unit complete with the bus-bars. The hinged doors of the controller and circuit-breaker compartment are mechanically interlocked with the isolating switch.

Loop Wiring

One-way switches with looping terminals are in fairly common use. The advantage of loop wiring has to some degree been negatived by inability to supply two-way switches which can accommodate an independent loop wire terminal. The two-way a.c. switch recently developed by J. H. TUCKER & Co., LTD., King's Road, Tyseley, Birmingham, makes provision for the necessary loop terminals and the makers can supply wiring diagrams to users of this type of switch.

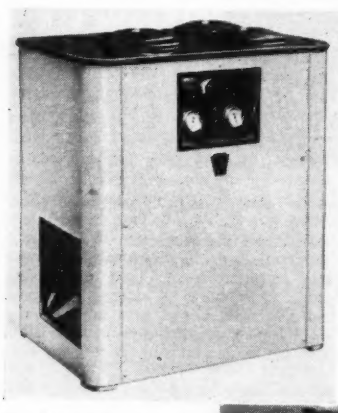
A Home Battery Charger

Designed to meet the requirements of the owner-driver, the new home battery charger of PHILIPS INDUSTRIAL, Charing Cross Road, London, W.C.2, is available in two types suitable for charging a 12- or 6-V battery at 1½ A, giving 25 hours' charging per kWh.

It comprises a black crystalline finished case which houses a double wound mains transformer and a suitable rectifying valve. In addition, a 6 ft. length of braided flex with lampholder adaptor is provided for the mains connection and 6 ft. of braided flex with a non-reversible plug for the battery connections.

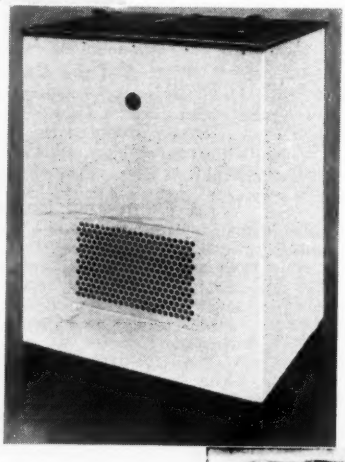
Ice Cream Equipment

By means of three appliances, introduced recently, the whole of the ice-cream processes from making to selling can be carried out by means of electricity. The ice-cream maker, combined with storer, is a new development by the LIGHTFOOT REFRIGERATION CO., LTD., Bush House, Aldwych, London, W.C.2. Operation is centralised, the controls being mounted on a sloping panel so designed to give maximum visibility. The insulation is of solid compressed cork and two quick-reading rotary thermometers indicate the temperatures.



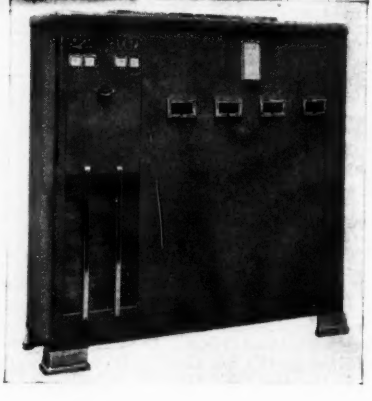
The output of the mixer per day (no swell) is 4½ gal., and each ½-gal. of mixture takes 20 minutes to freeze, the period between freezings being approximately an hour. The motor is rated at ¼ h.p. and the output figures are based on a 12-hour working day with the compressor in an air temperature of 75 deg. F. The fuses are easily accessible, being mounted on the control board, on both sides of the switch.

The same company has introduced recently an ice-cream storer with automatic temperature control and incorporating a hermetically sealed unit, a feature which also applies to the new storer of the INTERNATIONAL REFRIGERATOR CO., LTD. (B.T.H.), 169, Regent Street, London, W.1.



The temperature of the Lightfoot model can be adjusted between −5 deg. and +20 deg., the capacity being 4 gallons of bulk or brick ice-cream, although covering a total floor space of only 3½ sq. ft. An automatic resetting overload switch is incorporated. The B.T.H. storer, which is tested to a voltage of 1,250, is made to pump at 500 per cent. overload, is tested for leakage when submerged in water, and has to perform satisfactorily at full load in a temperature of 100 deg. F.; it has a capacity of 4 gal. bulk or 6 gal. bricks in one compartment with a floor area of 3¾ sq. ft. Cork insulation and moulded rubber lids are used for both models and both employ heavy gauge tinned copper sheet for the lining of the storage tank.

For selling, a fully automatic and electrically operated ice-cream vending machine has been introduced by the CENTURY REFRIGERATION CO., LTD., 12, Princes Street, London, W.1. The important feature of this machine is that, in addition to electrically operated delivery, electrical refrigeration is employed; this necessitates the cold chamber being heavily insulated and no dry ice is employed. The machine is constructed so that a choice of flavours can be given, if desired, and the entire operation with the exception of filling the cabinet and cartons is automatic. The cabinet is designed to withstand climatic effects.

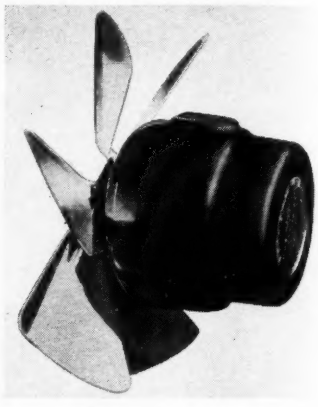


Ice cream can be made by the Lightfoot maker and storer (top), stored in the B.T.H. conservator (centre), and sold automatically by the Century all-electric vending machine (right)

A Special Fan Motor

The Delco fan, formerly used in connection with air conditioning and refrigeration, is now available for general applications from DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, London, S.W.1.

Having been designed for silent operation, and for positions where it is likely to get but infrequent attention, it is well suited to operate in appliances such as electric fires, domestic clothes dryers, kitchen ventilators, &c. The windings of the motor are so rated that they will not burn out even when the motor remains in a stalled position. The blades are designed to give minimum of windage noise consistent with good efficiency.

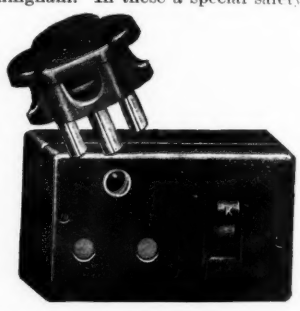


The Delco fan motor

The size is 3¾ in. in diameter by 3$\frac{9}{16}$ in. long, giving an air delivery of 480 cu. ft. per min. free air at 1,100 r.p.m.

Safety Switch-sockets

A new range of "Quail" switch sockets has recently been introduced by the KERSONS MANUFACTURING CO., LTD., Kingsbury Road, Minworth, Birmingham. In these a special safety shutter completely guards the sockets when the plug is withdrawn, and the d.p. switch automatically isolates both sockets from the mains supply. The switch, which is of the positive type, is operated by a specially shaped and reinforced moulded dolly, robustly constructed. All current carrying parts are of heavy-gauge phosphor-bronze or brass.



The Kerson "Quail" switch-socket

Cable entries are extra large for easy looping in and are marked N-E-L. The base is of strong vitreous china, and the cover is moulded and reinforced where necessary. In the surface pattern the porcelain base is recessed to allow adequate wiring space and knock-outs are provided on all sides.

The "clover leaf" plug top incorporates large terminals, a large cable entry and an adjustable cable grip.

Bonding of Cable Sheaths

A low-resistance bonding which it is claimed can be more quickly applied than lead strip and has been introduced by CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Victoria Embankment, London, E.C.4. It consists of a perforated screw-tightened strip of tinned copper passed round the cable sheath and attached at one end to the joint-box casting. The perforations are so spaced and the screw is of such a length as to enable cable of any diameter to be securely gripped, while the slight elasticity of the strip and the use of a spring washer under the screw head counteracts any tendency to creep.

Tests carried out by the makers on cables with diameters of 1.66 in. and 1.29 in. over the lead sheath gave in each case a resistance over the complete bonded box of 0.00108 ohm, as against 0.00037 ohm for an equivalent length of lead sheath. Readings were taken immediately after assembly and on the following day and also when the boxes had cooled to room temperature after combined filling and again after prolonged immersion in a water-filled ditch to produce premature aging. No increase in resistance was observed throughout the series of tests. The bonding can be applied to any existing standard Callender joint boxes for which lead strip is employed.

British Overseas Electrical Trade

In November the value of imports diminished, but exports further expanded

NOVEMBER was the third consecutive month in which British electrical exports attained a value surpassing that in any previous month in recent times, the respective amounts being £1,622,527, £1,717,254 and £1,722,530. Compared with November, 1936, which contained one fewer working day, last month's exports show an advance of £381,051, or 28 per cent. Contrasting with this appreciable improvement the value of electrical imports—£398,701—was lower than in any month this year except February, and was £28,091, or 7 per cent., below the amount for November, 1936.

The accompanying detailed figures abstracted from the Board of Trade returns show that the increase in exports was divided among most classes of equipment. The decrease of £34,518 in generating plant shipments is in comparison with a month when there were exceptional exports of this kind to India. Actually, the value for last month was next to the highest this year.

By far the largest increase was that of £101,249 in exports of telegraph and telephone equipment (not radio), in which Australia was principally concerned. The chief destinations, with comparative values (November, 1936, in parentheses), were as follows: Australia, £71,799 (£24,691); Argentina, £31,458 (£19,736); South Africa, £29,599 (£26,091); other foreign countries, £55,954 (£27,337); and other British countries, £47,368 (£37,074).

Cable exports were rather lower than in the last month or two, but were still substantially higher than last year, with Australia again the largest consumer, as the following analysis reveals:—

Rubber-insulated wires and cables: Australia, £42,923 (£27,867); South Africa, £23,398 (£27,342); British India, £14,787 (£17,460); New Zealand, £13,348 (£6,048); other British countries, £21,513 (£11,210); and foreign countries, £13,021 (£12,631).

Electric wires and cables, insulation other than rubber: Australia, £36,210 (£28,978); South Africa, £34,503 (£21,922); British India, £27,043 (£17,211); other British countries, £42,437 (£23,190); and foreign countries, £23,580 (£11,638).

Of the smaller items, the increase of £14,484 in electric cooking and heating apparatus is pleasing as an indication that British-made equipment is gaining ground in this field. In the machinery section the most consistent upward trend has been in exports of transforming plant, which in November reached the highest value this year. Shipments of motors and and decreases in the value of lighting and unenumerated electrical apparatus and motors compared with increases in similar exports. In number, imports of radio sets dropped from 11,076 to 3,864 and exports rose from 6,411 to 7,283, the corresponding numbers of valves being 227,114, 211,992 and 121,205, 159,391. The number of lamps imported decreased from 5.8 to 4.2 millions, exports increasing from 1.5 to 1.6 millions. Exports of house service meters numbered 12,280 last month, against 13,347 and 17,264 in the corresponding months of 1936 and 1935. In the machinery section imports

TABLE I.—EXPORTS AND IMPORTS DURING NOVEMBER

	Exports. Nov., 1937.	Exports. Inc. or dec. compared with Nov., 1936.	Imports. Nov., 1937.	Imports. Inc. or dec. compared with Nov., 1936.
Submarine telegraph and telephone cables	£536	− £1,044	*	—
Telegraph and telephone wires and cables (not submarine)	82,902	+ 34,816	*	—
Other insulated wires and cables	202,763	+ 87,266	£37,176	+ £613
Radio receivers, not radiograms (excluding valves)	39,990	+ 8,600	10,928	− 16,783
Radio transmitters (excluding valves)	31,256	+ 13,203	*	—
Radio valves	44,038	+ 2,108	18,010	− 7,041
Other radio parts and accessories	48,435	− 3,169	75,136	+ 2,824
Telegraph and telephone apparatus (other than radio)	236,178	+ 101,249	*	—
Electric carbons	*	—	8,433	− 3,865
Incandescent lamps	56,120	+ 7,333	12,737	− 5,843
Other lighting apparatus	49,728	+ 8,278	57,045	− 4,016
Primary batteries	16,099	+ 635	*	—
Accumulators	44,970	− 14,252	*	—
Electric cooking and heating apparatus	34,911	+ 14,484	*	—
House service meters	14,966	− 974	*	—
Other electrical instruments	30,658	+ 9,198	32,430	+ 10,156
Unenumerated electrical goods and apparatus	139,613	+ 28,367	81,101	− 5,967
Electric generators up to 200kW	31,730	− 10,690	*	—
Electric generators over 200kW	94,001	− 23,828	*	—
Electric motors	133,823	+ 44,048	26,408†	− 2,674
Convertors and transformers	80,610	+ 17,083	*	—
Starting and controlling gear for motors	39,632	+ 7,443	*	—
Switchgear	138,790	+ 38,403	*	—
Other electrical machinery	12,181	+ 1,155	22,651	+ 2,341
Electric vacuum cleaners	28,510	+ 11,249	16,646	+ 2,164
Total	£1,722,530	+ £381,051	£398,701	− £28,091

* Not classified separately. † Not railway and tramway motors.

TABLE II.—BRITISH ELECTRICAL EXPORTS DURING NOVEMBER

Destination.	Goods and apparatus, Nov., 1937.	Inc. or dec. compared with Nov., 1936.	Electric generators, Nov., 1937.	Inc. or dec. compared with Nov., 1936.	Electric motors, Nov., 1937.	Inc. or dec. compared with Nov., 1936.	Other electrical machinery, Nov., 1937.	Inc. or dec. compared with Nov., 1936.
Irish Free State	£49,912	− £8,197	*	—	*	—	*	—
Channel Islands	13,376	− 5,954	*	—	*	—	*	—
Union of South Africa	161,266	+ 22,202	£61,234	+ £36,336	£32,008	+ £11,138	£69,389	+ £8,997
British India	113,100	+ 8,665	7,918	− 66,805	14,303	− 1,507	31,632	− 8,411
British Malaya	34,113	+ 7,412	*	—	*	—	13,505	+ 2,365
Ceylon	13,757	+ 6,769	*	—	*	—	*	—
Hong Kong	15,091	+ 10,027	*	—	*	—	*	—
Australia	222,319	+ 96,358	13,178	+ 6,366	15,341	+ 5,191	28,252	+ 21,176
New Zealand	75,042	+ 31,471	*	—	14,115	+ 8,651	11,950	− 7,770
Canada	12,560	+ 4,190	1,977	+ 1,449	8,621	+ 3,927	5,943	+ 672
Other British Countries	82,939	+ 34,924	30,735	− 1,592	14,038	+ 3,438	50,364	+ 27,686
Sweden	20,328	+ 775	*	—	*	—	*	—
Denmark	17,716	+ 6,222	*	—	*	—	*	—
Netherlands	19,416	+ 2,527	*	—	*	—	2,191	+ 699
Belgium	14,606	+ 3,557	*	—	*	—	*	—
France	10,550	− 2,895	*	—	*	—	2,895	− 553
Portugal	2,875	− 3,187	*	—	*	—	*	—
Spain	1,157	+ 785	*	—	*	—	*	—
Italy	3,763	+ 1,990	*	—	*	—	*	—
Greece	5,604	− 27	*	—	*	—	*	—
Rumania	10,934	+ 4,591	*	—	*	—	*	—
Egypt	23,181	+ 16,151	*	—	*	—	308	− 898
China	1,027	− 11,251	*	—	*	—	—	− 2,060
Brazil	27,029	+ 10,823	*	—	*	—	*	—
Argentina	77,277	+ 34,666	*	—	*	—	1,570	− 832
Other Foreign Countries	131,315	+ 43,648	10,689	− 10,272	35,397	+ 13,210	53,214	+ 23,013
Total	£1,163,253	+ £296,188	£125,731	− £34,518	£133,823	+ £44,048	£271,213	+ £64,084

* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

switchgear were less than in October, although substantially ahead of the figures for November, 1936.

Points of note in considering the analysis of exports according to destinations are that for the fourth month exports of apparatus to the Irish Free State have been below the values for the corresponding months of last year; in the last two months exports to China (generators and motors are not given separately) have amounted to £2,877, against £24,131 in the corresponding period of last year; and the increase in shipments to Argentina was the third successive one of a substantial nature.

Among imports the only increase of any size was in electrical instruments. On the balance, radio imports were lower, aggregated 288 tons (against 266 tons) and exports 3,040 tons (2,766 tons).

The following is an analysis of the chief sources from which goods and apparatus were obtained last month, with comparative values: United States, £95,048 (£115,183); Germany, £76,061 (£81,716); Netherlands, £56,598 (£51,132); Switzerland, £18,275 (£15,864); Belgium, £15,583 (£22,807); France, £9,993 (£9,928); Austria, £6,164 (£12,538); other foreign countries, £40,674 (£38,897); and British, £14,600 (£14,856).

In the eleven months up to the end of November the total value of exports of electrical equipment was £16,713,404, an improvement of £3,068,628. Imports amounted to £4,561,039, an increase of £580,634.

Municipal Trading at Southend

THE trading activities of the Southend Corporation Electricity Department, in which the department's relations with local contractors and retailers are involved, have recently been under discussion. In September the local Chamber of Trade placed a statement on the subject before the Electric Lighting Committee. This refers to an agreement arrived at in 1931 providing, *inter alia*, that the Corporation should supply on hire-purchase all electrical apparatus (except lighting fittings and lamps), where the amount involved was not less than £2; the terms of hire-purchase were detailed. It was also stipulated that when a contractor effected the sale of a cooker, wash-boiler or water heater and the appliance was to be provided by the Corporation under the hire-purchase scheme, the discount usually allowed to the trade was to be divided equally between the Corporation and the contractor.

The agreement apparently precluded cash sales by the Corporation, but in June last year the borough electrical engineer (Mr. A. C. Johnson) sought powers from the Council to sell apparatus to consumers for cash. To this the Chamber of Trade objected as thereby the Corporation would be in competition with rate-paying electrical contractors and retailers.

The statement says that the borough electrical engineer had referred to "the limited assistance" given by the electrical contractors. The Chamber claims, however, that the latter have done everything possible by the provision of well-equipped and displayed showrooms to encourage the use of electricity and electrical appliances.

The Corporation, as it can raise money cheaply, is able to engage in hire and hire-purchase business on extremely favourable terms to the consumer with which the private trader cannot compete; he therefore has to rely solely upon cash sales for his livelihood, or in the case of the approved contractor, on wiring.

It is submitted that no case is made out that the borough electrical engineer could do any more to increase cash sales than the traders concerned are doing. The Chamber interprets Clause 48 of the 1926 Act as intending to give municipal undertakings powers to sell appliances for cash where other facilities do not exist.

In conclusion, the Chamber emphasises the need for the institution of a joint development committee comprising, among others, representatives of the undertaking and local electrical contractors as recommended in the Electricity Commissioners' Committee on assisted wiring and hire-purchase.

Chamber of Trade's Proposals

A scheme has been drawn up by which "approved dealers" (at the outset members of the Southend branch of the E.C.A., members of the National Association of Electrical Retailers and registered contractors) would supply to the Corporation's showroom apparatus up to a value of £1,000, except cookers, water heaters and wash-boilers to which the Corporation's simple hire scheme should be confined. The amount of the first quarter's hire should continue to be paid to the approved dealer making an introduction.

If a consumer desired it a hire-purchase transaction should be dealt with by an approved dealer, the Electricity Committee being credited with 10 per cent. of the net profit, the other 90 per cent. going to an "approved dealers' distribution account." If a transaction were refused by an approved dealer the Committee would also decline it. Where the transaction was, at the consumer's request, carried through by the Committee 10 per cent. of the net profit should be credited to the "approved dealers' distribution account." The balance standing to the credit of this account would be distributed equally to approved dealers on the usual quarter days.

The Engineer's Views

In his report on the matter Mr. Johnson points out that the tendency for supply undertakings to sell apparatus direct to consumers is increasing. In a residential area such as Southend the provision of heavy current-consuming appliances is of vital importance to the undertaking. The sale of smaller appliances is also regarded as important because their use leads to a demand for the larger equipment.

He considers that there is at present insufficient contact between the department and the 37,000 consumers who are discouraged from calling at the showrooms for advice and information because of restricted trading. "If they visit the showrooms of local contractors they find generally an inadequate display or a display of both gas and electrical appliances; because of long usage the majority of people will think of cooking and heating by methods other than electricity and the display of the alternatives is not conducive to electric business." Mr. Johnson also maintains that "a large section of the community are reluctant to enter into personal questions of hire and hire-purchase with the local contractors; they have, however, no objection to discussing such mattters with gas or electricity undertakers."

The Chamber's proposal that "approved contractors" should stock the Department's showroom is not regarded with favour; the apparatus might not be suitable and the value of the suggested stock (£1,000) is considered inadequate. Moreover, the Corporation would have to maintain the apparatus which would be liable to be returned by consumers in second-hand condition. Mr. Johnson says that of five undertakings which have agreed to such an arrangement, three have found it unsatisfactory and one anticipates that the system will be discontinued in the near future.

Hiring of Small Appliances

At present the whole of the Corporation's trading in smaller apparatus is carried out under the simple hire scheme. The estimated value for the current financial year is £20,000 on which the trade discount would be about £4,000. If a hire-purchase scheme were substituted it is probable that a large portion of the business (representing a consumption of over 700,000 kWh per annum) would be lost.

It is shown that the granting of discounts to contractors by supply undertakings is rare. Mr. Johnson points to the costs which the Corporation would have to bear in displaying the goods, and believes that the effect of the scheme would be to transfer a large portion of the financial benefit from the trade built up by the Corporation to a small section of traders. The effect would also be detrimental to electrical traders not included in the list.

He is, however, in favour of granting discounts to all contractors who introduce business to the department and of selling goods stocked in the showrooms to contractors on the usual manufacturers' terms, the Corporation retaining the preferential discounts. He hopes that in return the contractors will give their full support to the showrooms and purchase their requirements from the Corporation.

Mr. Johnson refers to the results obtained from the granting of commission to contractors assisting in securing hire agreements for cookers, &c., and recommends the extension of this to builders and house agents, who, he says, are in more intimate contact with prospective householders.

Among other recommendations it is proposed that the Corporation shall make cash and hire-purchase sales direct to consumers of all "electric fittings," as defined in Clause 48 of the 1926 Act, at recognised retail prices. Where cash sales are made at the showrooms to domestic consumers introduced by contractors, the contractor concerned will be credited with the ordinary trade discount less 5 per cent. of the retail price.

It is recommended that the terms of the existing hire-purchase schemes for wiring and apparatus shall be varied by requiring the repayment of retail prices plus interest by equal quarterly amounts instead of an initial deposit of 20 per cent. and the balance by equal instalments, the rate of interest to be 1 per cent. over the bank rate (minimum 4 per cent.) instead of the present 6 per cent. There shall be an option of extending the period of repayment for assisted wiring installations from 20 to 40 quarterly payments. The 40s. minimum limit for the hire-purchase of apparatus shall be abandoned.

Mr. Johnson thinks that the periodical meetings between himself and "approved contractors" have been of value and should be continued.

The report was to come before the Council at this week's meeting.

Engineer's and contractors' conflicting opinions

Local contractors object to cash sales from the Corporation showrooms: Mr. A. C. Johnson recommends their extension

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Prospects for Engineers

A leaflet has been issued by the Ministry of Labour (Choice of Occupation, No. 3, Stationery Office, 1d.) containing an outline of the conditions of work and prospects in the engineering industry for the information of boys leaving school at about 14 years of age. Reference is also made to the principal scholarships, certificates and diplomas obtainable. This pamphlet supplements the fuller particulars presented in No. 16 of the "Choice of Career" series (Stationery Office, 6d.) issued by the Ministry last year.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Wiring Regulations in New Zealand

During the year ended July 31st last forty-five prosecutions were made by the New Zealand Electrical Wiremen's Registration Board, according to the *N.Z. Electrical Journal*. Sixteen cases were taken against unauthorised persons who had carried out installation work, five of them being consumers. Eight prosecutions were in respect of the connecting up of wiring before obtaining permission; one was for failure to maintain an installation; eight for failure to notify the supply authority of the intention to undertake wiring work; one for making dry joints in a conductor; one for obstructing an inspector of electrical wiring; and five for permitting others to do wiring work. During the year sixty-seven reports of breaches of the Electrical Wiremen's Registration Act and fifty reports of breaches of the Electrical Wiring Regulations were received by the Board. It is noted that the figures given do not include prosecutions taken by electricity supply authorities.

Christmas Window Displays

Electrical gifts for Christmas are now as popular as other appliances for household use, and although this is due in a large measure to the rapidly increasing use of electricity for domestic purposes, electrical manufacturers and supply authorities have assisted in giving a stimulus to the Christmas trade by arranging seasonal window displays which cannot fail to attract. Two examples of their efforts are shown in the accompanying illustrations. That of the General Electric Co., Ltd., is one of a number arranged by the company at its headquarters at Magnet House, Kingsway, W.C.2, and shows various examples of the company's decoration lighting sets. The other is an example of co-operation between supply authority and manufacturer, and is a display at the Willesden Borough Council's electricity showrooms of Siemens electrical appliances, including irons, kettles, shaving pots, fires and hair-dryers. A large centrepiece consisting of a modern villa with a signpost nearby upon which are the Siemens shield trade mark and the appropriate wording "The sign of warmth, comfort and cheer" is the main feature of the display.

Two effective Christmas window displays

The "Better Light—Better Sight" Campaign

The children's competition organised by the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board in connection with the "Better Light—Better Sight" campaign was concluded on December 13th, when the presentation of sixty-three prizes was made to the winning entries at the Town Hall, Stalybridge. The prizes were presented to the girls by Mrs. F. D. Ashton, wife of the chairman of the Board's Electricity Committee, and the prizes to the boys were presented by Mrs. J. Buckley, wife of the deputy chairman of the Committee. A film show was arranged at which cartoon films, two films by the Health and Cleanliness Council, and "The Face of Britain" were shown. The chairman of the meeting was Councillor F. D. Ashton, chairman of the Board's Electricity Committee, and he was supported by Ald. J. Buckley, deputy chairman, and Messrs. J. H. Lumsden (chief engineer), S. T. Davies (secretary) and A. G. Grundy (transport manager).

Australian Electrical Imports

Imports of electrical machinery and appliances into Australia in the twelve months ending 1936-37 totalled £3,853,000 in value, an increase of about 15 per cent. compared with the preceding twelve months. The largest specified item was cable and wire with a total of £1,075,000, compared with £903,600; next came dynamo-electric machines at £573,400 (£515,200), then telegraph and telephone material at £527,800 (£462,600) and lamps at £221,600 (£206,600). The small total of £28,900 (£24,300) represented batteries and accumulators, while there was an item of "other" electrical machinery and appliances totalling £1,426,000 (£1,249,000), details of which will not be known until the annual statement of the overseas trade of the Commonwealth is published.

An Electric Fire Chart

Belling & Co., Ltd., have issued a wall chart showing all the electric fires manufactured by the company, together with an index of the list prices, as well as the names of fires with their respective list numbers.

A Passenger Transport Year Book

We have received a copy of the 1938 Directory and Year Book of the *Passenger Transport Journal*. Bound in a strong red cover it forms a concise reference book of the passenger transport industry. One of the sections includes details of personnel of municipal and company operated passenger transport undertakings (including the London Passenger Transport Board) and electric railway undertakings in Great Britain and Ireland, with full particulars of rolling stock operated, while another includes a list of the important overseas electric railway, tramway and omnibus undertakings. Other information includes a list of members of the Municipal Tramways and Transport Association, and the addresses of associations and institutions. The usefulness of the directory is increased by a diary (one week to a page).

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-Making Industry announces that the "cost of living" figure (60 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in January.

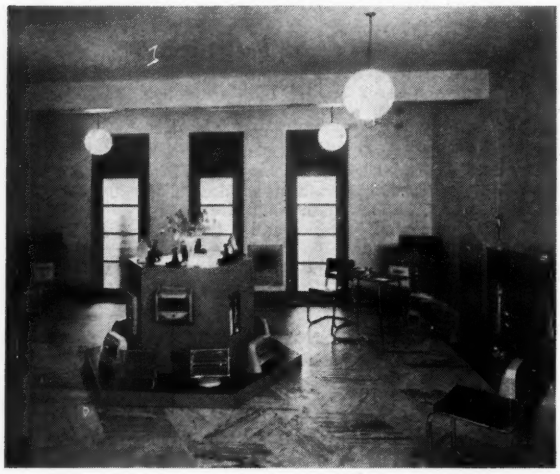
Employment in November

Employment in the engineering industry in November declined slightly, but continued good on the whole, remaining very good in electrical engineering. According to the *Ministry of Labour Gazette*, the number of unemployed in the engineering industry was 62,700, or 5.3 per cent., as compared with 4.9 per cent. in October, but a decrease of 0.5 per cent., as compared with November last year. In the electrical engineering section the number of unemployed was 3,555, or 3.1 per cent. (3 per cent. in October and 3.3 per cent. in November, 1936). The unemployed in the electrical wiring and contracting industry numbered 3,637, or 8.8 per cent. (8.9 per

cent in November, 1936). In the cables, apparatus, lamps, &c., group the unemployed numbered 10,275, the percentage rising from 4.4 to 5.8 (4.9 per cent. in November, 1936).

English Electric Co.'s New Bristol Showrooms

The English Electric Co., Ltd., has recently opened new showrooms at Bristol, and part of these is shown in the accompanying illustration. The showrooms include a section



An interior view of the new Bristol showrooms of the English Electric Co., Ltd.

where cookery and washing machine demonstrations are given. This section also includes examples of the company's water heaters, which are connected up. A large display window is at present showing the company's current fire window display unit. Stocks are held at these showrooms of the complete range of the company's domestic electrical appliances, and there is a trade counter from which the demands of wholesalers, retailers and electrical contractors can be met. The architects were Messrs. Farmer and Dark.

A Guide to the Rhodesias and Nyasaland

We have received a copy of the first edition (1937) of the "Year Book and Guide of the Rhodesias and Nyasaland with Biographies," published by Rhodesian Publications, Ltd., of Salisbury, S. Rhodesia (price 3s. 6d. post free). This guide of 672 pages contains articles and data relating to industries, finance, sports and the many other activities of Southern and Northern Rhodesia and Nyasaland. A tariff of Customs duties in Southern Rhodesia includes electrical plant and apparatus showing the general rates, those applicable to British Dominions and those for the United Kingdom, Northern Ireland, the Colonies, Protectorates and Mandated Territories.

Electricity in the Laundry

In our description of the new laundry of the Royal Arsenal Co-operative Society at Mitcham in our issue of December 10th (page 817) the makers of the lift installed were given as Champness Bros., Ltd. Their correct title is Hammond & Champness, Ltd.

London Railway Termini Decorations

The railway companies have entered into the festive spirit of the Christmas season, and three of the London termini now present a very gay appearance. At Paddington the decorations include the transformation of the pillars on the concourse into giant candles, with flames of variegated colours which glow and dim by turns. Hanging in the centre is a Christmas scene showing a village with inn and cottages sheltering beneath a castle, above which is a star-encrusted sky. The setting is completed with strings of coloured lights and a large illuminated lantern. The total lighting load is 35 kW. Euston and St. Pancras stations have also been transformed by the L.M.S. Railway Co., and now present a "Christmassy" appearance. In addition to the decorations on the stations themselves, the roadway leading into St. Pancras is now an avenue of Christmas trees electrically illuminated. For the various decorations of the two stations eight floodlights and twelve spot lights are used, while the number of fairy lamps is 2,500. The total load is 26 kW.

Hotplate Cooking Utensils

Mr. T. N. Veitch, joint managing director of Hague & McKenzie, Ltd., has issued in booklet form a series of articles on hotplate cooking utensils which have appeared in the *Hardware Trade Journal*.

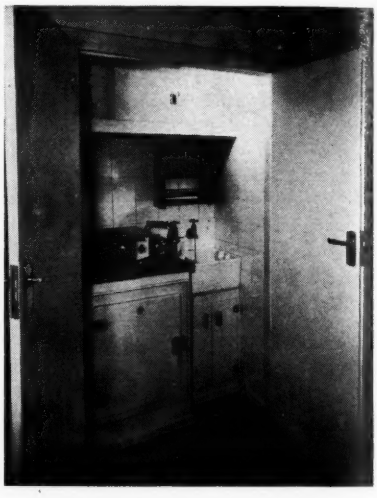
Changes of Address

The National Joint Industrial Council for the Electrical Cable Making Industry has removed to High Holborn House, 52-54, High Holborn, W.C.1 (telephone: Holborn 7633).

The address of the Radio Wholesalers' Federation is now 58, Gordon Square, W.C.1 (Museum: 3218).

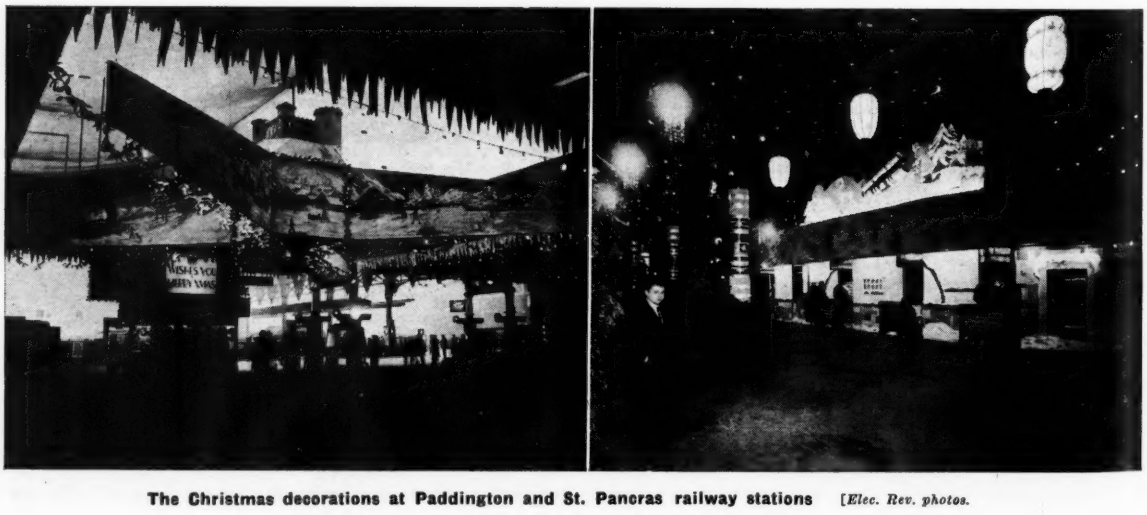
Saving Space in Flats

The fact that the living rooms in the new Marsham Court flats, Marsham Street, Westminster, are exceptionally commodious is due to a large extent to the economy in kitchen room made possible by employing electrical equipment throughout. In the smaller flats especially the kitchen arrangements are a masterpiece of compactness. Contained in a cupboard-like recess only 9 ft. 6 in. high by 4 ft. wide by 2 ft. deep adjoining the entrance hall are a B.N.E. table cooker and kettle, with a refrigerator beneath, a stainless steel sink and cupboards. An electric light is provided above.



This kitchen recess at the Marsham Court flats takes up the minimum of space [*Elec. Rev photo.*

In all the 150 flats the refrigerator is operated from a central plant (thermostatically controlled) comprising five Frigidaire compressors, situated in the basement. This arrangement, of course, obviates the necessity for space for housing compressors in the kitchens themselves. Bratt Colbran reflector fires are installed in the living rooms and there are adequate points for portable radiators, standard and table lamps, irons, toasters, clocks, &c., as well as a special connection to radio and television aerials. One telephone is provided in each flat without charge. There is a G.E.C. door buzzer. The electricity tariff (¼d. per kWh if a



The Christmas decorations at Paddington and St. Pancras railway stations [*Elec. Rev. photos.*

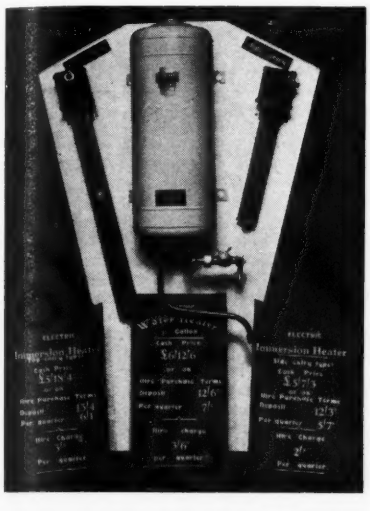
cooker is installed, otherwise 1d.) has induced about 80 per cent. to cook electrically.

Electrical apparatus installed in the main kitchen, which serves the restaurant and the various dining rooms, includes both roasting and pastry ovens, hot cupboards and toasters (all installed by Richard Crittall & Co., Ltd.) and a Frigidaire ice-cream apparatus. Premier hot-plates keep food warm in the restaurant, which is air conditioned by a Matthews & Yates plant. Each of the public dining rooms has its own hot-cupboard and refrigerator. Attractive lighting fittings have been supplied by Troughton & Young, Ltd., and the G.E.C. The electrical contractors for the whole building were Pinching & Walton.

Team Valley Trading Estate

A booklet has been issued by the Team Valley Trading Estate outlining the advantages and services available to manufacturers contemplating the erection of factories on the estate. Particulars are given of the electricity supply, including the tariffs for lighting and power.

Water-heating Week at Halifax



One of the display boards which formed part of the window displays during the water-heating week at Halifax

A special water-heating week was recently arranged between the electrical contractors and the Halifax Corporation Electricity Department and, as part of the publicity, display boards were made up and twenty-five of these were distributed among the electrical contractors in Halifax and were prominently shown in their windows during the week. One of these display boards is shown in the accompanying illustration. Mr. G. A. Vowles, the Corporation electrical engineer and manager, informs us that as a result of these displays the Electricity Department has received a large number of applications for water heaters.

More Trolley-Buses for London

A contract for 100 more trolley-buses, to cost about £200,000, has been placed by the London Passenger Transport Board. This contract will result in the speeding up of deliveries from six to ten vehicles a week. At present the Board's fleet of trolley-buses numbers 766 and 616 are on order. The vehicles now ordered will be allocated to the Ilford-West Ham, Barnet-Holborn and Enfield-Tottenham Court Road routes, which are now being converted to trolley-bus operation.

Trade Announcement

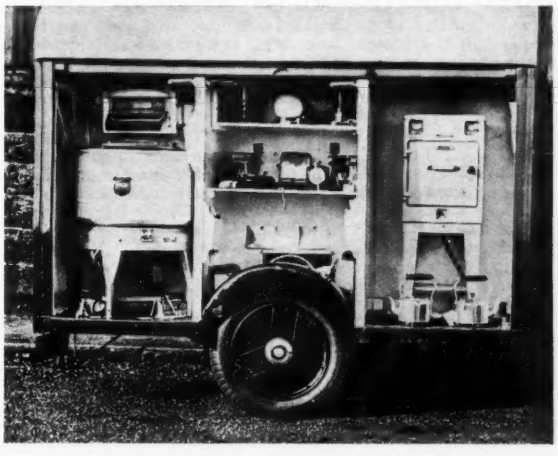
Radio Transmission Equipment, Ltd., has removed its factory and offices to 45, Nightingale Lane, Balham, S.W.12.

War Damage to Buildings

The London Chamber of Commerce has sent a letter to the President of the Board of Trade asking the Government to introduce legislation to release tenants in whole, or in part, from the obligations of rebuilding clauses in their leases, where there is damage or destruction by enemy action, so long as war risk insurance facilities are unobtainable. According to the Chamber's information the legal position is that where there are repair covenants, if premises are destroyed or injured by enemy aircraft, or even catch fire in consequence of damage to adjoining premises by enemy action, the tenant is obliged to rebuild them notwithstanding that the risk is uninsurable. Whilst the Chamber regards it as reasonable to ask a tenant to pay an insurance premium, which he normally considers as a small addition to his rent, it is submitted that it is inequitable to expect him in the absence of any insurance facilities to rebuild the owner's property if it happens to be destroyed during his tenancy.

A Trailer for Electrical Demonstration

R. A. Dyson & Co., Ltd., have recently supplied the Mersey Power Co., Ltd., with a special two-wheel trailer, designed to be towed behind a private car, which the Power Co. is using for conveying domestic electrical appliances for demonstration in its area of supply. The trailer has a carrying capacity of 6/8 cwt., and, as our picture shows, is divided into six compartments. The vehicle is wired for a 230-V circuit and is fitted with the necessary fuses, switches, &c. The Power Co. has plugs fixed upon the distribution poles to which connections can be made. The value of being able to demonstrate the apparatus instead of merely showing it will be readily appreciated. As low loading is important, the trailer is fitted with a cranked axle.



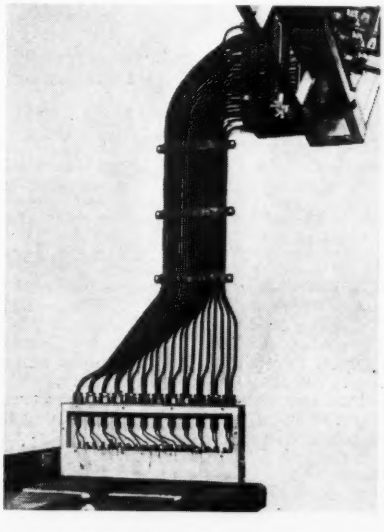
A trailer supplied by R. A. Dyson & Co., Ltd., for electrical demonstration purposes

An Exporters' Guide

The "International Mercantile Diary and Year Book" for 1938, which has just been received (Syren & Shipping, Ltd., 10s. 6d. net), is similar in form to previous editions. It provides a useful guide to all firms interested in the export trade, and includes information of consular documents and regulations for the shipping of goods all over the world, a desk diary, and a compendium of commercial information. The international section deals with every country in the world in turn, one of its main features being a complete account of the number and kind of consular and commercial invoices and certificates of origin required in each case, showing in detail how they should be filled in.

New "Nesco" Showrooms

More than seventy guests attended the recent opening of the North-Eastern Electric Supply Co.'s new showrooms in Bridge Street, Morpeth. The ceremony was performed by the Mayor (Coun. John Dixon). Tea was served later at the Queen's Head Hotel, Mr. W. F. T. Pinkney presiding. The Mayor and Mayoress were presented with an inscribed coffee service and tray to mark the occasion. The new showrooms consist of a main room with an extensive display of electrical apparatus, office accommodation, store room and a lecture theatre where cookery demonstrations will be given. The branch showrooms opened by the company now number twenty-six and a further three are projected for Alnwick, Blaydon and Thirsk.



A neat wiring job: a G.E.C. cooking range aboard a ship wired with Pyrotenax cable

B.T.H. Willesden Staff Dinner

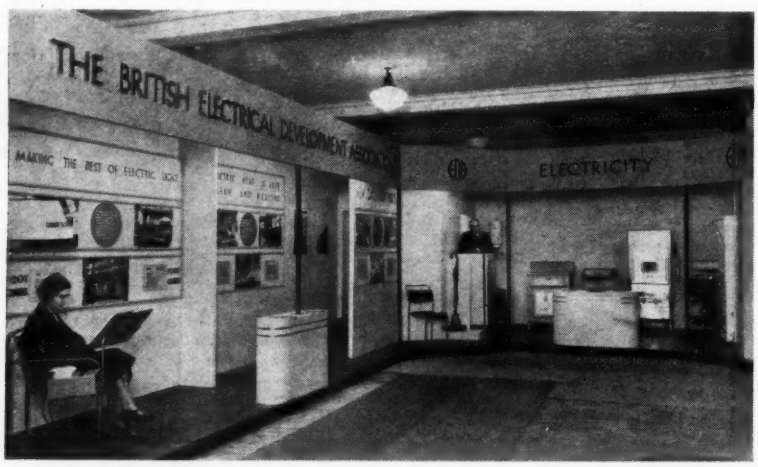
About 230 members of the British Thomson-Houston Co.'s Willesden Works organisation, with visitors representing the constituent companies of A.E.I., Ltd., attended a dinner held at the Connaught Rooms, Kingsway, on December 17th, with Mr. T. Hands (manager) in the chair. Mr. G. E. Riley (manager, switchgear sales), proposing the toast of "Associated Electrical Industries, Ltd.," referred to it as a great national asset and pointed out that the associated companies had a pay roll of 42,000 (equivalent to 15 per cent. of the total number

employed in the electrical manufacturing industry) and were responsible for the direct support of about 150,000 people. Sir Felix Pole (chairman, A.E.I., Ltd.) said that amalgamation did not always have such happy results; it was frequently said that the amalgamation of two good concerns produced one bad one, with loss of identity and goodwill. This had been avoided in the present case, with the retention of identities and actual competition between the various companies. Referring to future business conditions he took a very optimistic view. His considered opinion was that there were good times ahead for at least two years. Mr. W. C. Lusk (deputy chairman and managing director, A.E.I., Ltd., and chairman, B.T.H. Co., Ltd.) also referred to the amalgamation, and stated that when A.E.I. was first formed a number of persons seemed surprised that three separate switchgear manufacturing organisations should be retained. The wisdom of this course had been amply justified by the very fine record of the three companies. Sir John Chancellor (director, A.E.I., Ltd.), mentioned his early connections with electrical engineering when, as a cadet at Woolwich, he had attended lectures at which apparatus formerly the property of Faraday had been used, and expressed his satisfaction at being once more connected with the industry.

Social Events

The annual Christmas dinner and dance of J. H. Tucker & Co., Ltd., organised by the Recreation and Social Club, was held at the Imperial Hotel, Birmingham, on December 10th. A large gathering representative of all sections attended and among the company's officials present were Mr. J. B. Tucker (managing director) and Mr. C. Macbeth (director). Dinner in the traditional Christmas style was followed by a short concert and then the evening was given over to dancing.

A dance of the Social and Athletic Club of the G.E.C. was held on December 15th in Harrod's ballroom, when, among those present, were Mr. and Mrs. M. J. Railing and Mr. and the Hon. Mrs. Gamage. About 800 members of the staff of various parts of the London organisation attended. A cabaret show was given during the evening by the Eight Step Sisters and a delightful couple gave an exhibition of ballroom dancing. During the interval Mr. H. Wilson, on behalf of the whole assembled company, took the opportunity of wishing Mr. and Mrs. Railing happiness and good health for Christmas and the New Year. Mr. Railing suitably replied. A noteworthy feature of the evening's entertainment was that the music was provided by a band under the leadership of Mr. J. Gibb, a member of the G.E.C. staff, who brought his orchestra to add to the evening's pleasure.



The E.D.A. stand at the "News Chronicle" Schools Exhibition

Prices of Materials

Henry Gardner & Co., Ltd., report, December 22nd: Copper bars (best selected), sheet and rod, £74, £2 dec. English pig lead, no change. Spelter, £15 2s. 6d., 6s. 3d. inc. English block tin, £187 5s., £3 5s. dec.

Edward Till & Co. report, December 22nd: India rubber, Para fine, 7¼d., ¼d. dec.

For Sale

Spalding U.D.C. has for disposal one 500-kVA transformer.

The North Wales Power Co., Ltd., has for sale two 600-kW motor generators and four 500-kW d.c. generators.

(See our Classified Advertisements.)

Electricity in Schools

The installation of up-to-date electrical equipment in schools is especially important, not only because it provides in its many ways an atmosphere very conducive to learning, but because it creates in the minds of the students a desire for the labour-saving, health-giving and dirt-eliminating facilities that can be furnished by electricity in their own homes. At the *News Chronicle* Schools Exhibition, which is being held at Dorland Hall, London, S.W.1, until January 12th, parent and pupil, as well as educationalist and school designer, can see electrical features of schools which in a few years' time may be regarded as standard practice. Apart from a collection of models and photographs of both existing and future buildings from all over the world there is a series of actual rooms as provided in a modern school. How housework can be lessened and simplified is demonstrated in the cookery, laundry and housewifery sections by the use of electric cookers, refrigerators, washers, drying cabinets and irons. Features of a model classroom are the high intensity, non-glare lighting provided by Benjamin fittings, air-conditioning by a portable Carrier Weathermakers' plant, and a Leevers-Rich sound reproducer. The importance of adequate lighting is stressed on the large stand of the British Electrical Development Association both by the E.L.M.A. light-selection recorder and by a table showing the correct light values for typical schoolrooms. Photographs and actual equipment indicate the best types of electric heating for various purposes. Also on the E.D.A. stand is a display of kitchen equipment including a washer, wash boiler, drying cabinet, water heater, cookers, refrigerator, floor polisher and clock. Several examples of lighting installations by G.V.D. Illuminators, Ltd., are to be found in the exhibition. Electric clock systems are demon-

Belling's Twenty-five Years

ON Wednesday, last week, at the Royal Theatre of Dancing, Tottenham, Mr. C. R. Belling, M.I.E.E., of Belling & Co., Ltd., electric fire and cooker manufacturers, entertained the staff of his Enfield factory to a dinner and a dance and cabaret, to celebrate the twenty-fifth anniversary of the business. About 600 sat down to dinner.

During the evening Mr. Belling was presented with a dressing case and a bound volume containing the signatures of all employés. In the course of his reply, he naturally became reminiscent, first recalling that he started in a small Enfield garage with only a man and a boy. One of his first products was a water heater with a loading of 10 kW, but manufacture was soon discontinued because owing to its high loading supply authorities looked at it with considerable disfavour. The fire business, however, developed so rapidly that in 1913 a move was made into a larger factory at Edmonton, and in the following year the size of this factory was doubled. Mr. Belling said that the firm was the first to introduce the use of a nickel chromium spiral wire mounted on a refractory base, and many of the fires made then are still in use to-day. There were very few fire manufacturers at that time and the other types of elements in general use were "sausage" lamps and quartz tubes. Convectors were also in evidence.

During the War many thousands of fires and cookers were made for the Admiralty, principally for use in submarines. When cookers began to form an important part of the firm's activities, Mr. Belling introduced the combined boiler-griller plate which is now almost universally in use to-day.

In 1924 the business had developed so rapidly that a 10-acre site in Enfield was purchased, and the first bays were built, equipped and occupied in the following year. Further bays were added and a large foundry, vitreous enamelling plant and kilns for the manufacture of refractories were erected, and the factory now consists of 40 bays each 200 ft. long covering an area of 180,000 sq. ft. Further extensions are being made early in 1938. Continuing the speaker referred to the "Baby Belling" cooker which was helping to increase the interest in and development of electric cooking, and he added that two of the latest streamline cookers had been installed in the kitchens of the Royal Nurseries at Sandringham, while a great many fires were in use in Buckingham Palace and other Royal households. Last year the output was so large that a big effort would be necessary to beat it, but it looked like being beaten.

Mr. Belling said that he considered that the success of the business had been largely due to Press advertising, and in this connection he referred to the showroom in Regent Street, which was being so largely used. The firm had been well repaid for the money spent in advertising in the national and local papers as well as in the trade papers. The average number of employés was 800, at times it had exceeded 1,000, and well over one million of their fires and hundreds of thousands of cookers had been made and sold.

Mr. Belling added that as a result of the success of Belling & Co., Ltd., he had been able to join in financially with and as a director of eight other firms, giving employment to between three and four thousand people.

In conclusion he referred to a pension fund and handed a cheque for £5,000 to the chief accountant, to inaugurate this scheme.

strated by the International Time Recorder Co., Ltd., and visitors can also see how Dictaphone equipment can be used. Speaking on the telephone *via* a beam of light, and the visual reproduction of sound waves on a cathode-ray oscillograph showing the effect of cutting off certain frequencies are attractions of a fascinating exhibit prepared by the Post Office. A "Stentorian" public address system has been installed throughout the exhibition by the Whiteley Electrical Radio Co., Ltd., and G.B. Equipments, Ltd., were responsible for the sound projection equipment in the conference hall.

Calendars, Diaries, Etc.

Laurence, Scott & Electromotors, Ltd., have sent us a calendar with a well-executed picture of warships in the Bay of Biscay, which is in one of its turbulent moods.

A maiden on the cliffs facing the sea breezes makes a charming study (reproduced on silk) for the calendar received from Christy Bros. & Co., Ltd.

As in previous years we have received two calendars from the Lytham St. Annes Corporation Electricity Department. "Hunt the Slipper," reproduced from an oil painting by Marion Harvey, portrays a cheeky "Scottie," and the other calendar bears a fishing scene entitled "A Quiet Haven."

Lindsay & Williams, Ltd., have again sent us a calendar with large daily slips in bold red figures.

A colourful picture of a garden at sunset has been selected by the Hart Accumulator Co., Ltd., for its calendar which has monthly slips, including the previous and succeeding months.

We have received from the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., a refill for an engagement book sent last year.

The calendar of Mavor & Coulson, Ltd., has large monthly sheets surmounted by a picture of Loch Arne with Ben Cruachan in the distance.

The diary received from the London Electric Supply Corporation, Ltd., is bound in light green leatherette, and has a thumb index for each month.

Illustrations in colour of steam turbines and other installations carried out by the company appear on the calendar of C. A. Parsons & Co., Ltd., which has monthly sheets.

The calendar of Ruston & Hornsby, Ltd., has large monthly sheets, each of which bears an illustration of an installation for which the company supplied the plant.

A cut-out of one of their screws, in black and gold, forms the calendar of D. Gilson & Co., Ltd., which has daily slips.

We have received a calendar for 1938 from Mr. Christopher Wade, of Gabriel, Wade & English, Ltd. This bears a well-executed picture of an auburn beauty with the appropriate title of "Sweet as a Rose."

"Night and the Stars are Calling" is the title of an evening picture on the block calendar sent us by the Supra Electrical Co., Ltd., which shows a fair-haired lady sitting contemplatively on a terrace.

Fernand Espir, Ltd. (agents for Great Britain and Tréfileries et Laminoirs du Hâvre) have sent us a refill for their desk calendar.

The calendar of Crofts (Engineers), Ltd., has monthly sheets illustrating some of the company's products.

The large monthly sheets of the calendar of the British Jeffrey-Diamond, Ltd., are surmounted by a reproduction from a photograph of a picturesque chapel in the grounds of Kettlethorpe Hall, near Wakefield.

The diary of the Edison Swan Electric Co., Ltd., has a navy-blue leatherette binding, and in addition to the general information contains sectional maps of Great Britain and Ireland and a map showing the main thoroughfares of London. The company's two calendars have large daily slips mounted on a board showing the calendar for the whole year. One advertises "Ediswan" lamps and the other the company's cables.

The County of London Electric Supply Co., Ltd., has chosen twelve humorous drawings for its calendar, which has monthly sheets. Each picture bears a rhyme with an electrical "twist."

The calendar of Bull Motors is in blue and gold with a cut-out of the companys trade mark (a bull's head) at the top.

"Memories" is the title of the attractive picture of the calendar of Alklum Storage Batteries, Ltd., which shows a "fetching" maiden holding a string of pearls.

A handy pocket comb in a neat metal case has been received from Venner Time Switches, Ltd., together with a booklet of humorous hints as to its use.

A six-inch rule in a red leather case which can be conveniently carried in the waistcoat pocket has been sent us by Price & Belsham, Ltd.

A young lady warming herself before a fire adorns the calendar of the Hotpoint Electric Appliance Co., Ltd.

We have received a calendar for 1938 from Mr. Christopher Wade, of Gabriel, Wade & English, Ltd. This bears a well-executed picture of an auburn beauty with the appropriate title of "Sweet as a Rose."

New Catalogues and Lists

J. Eastick & Sons, 118, Bunhill Row, London, E.C.1.—A 168-page illustrated catalogue of all kinds and makes of domestic electrical appliances.

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, London, N.1.—A leaflet illustrating the new No. 73 dispersive reflector.

T. B. Morley & Co., Ltd., 26-32, Gt. Arthur Street, Golden Lane, London, E.C.1.—An 83-page catalogue of "Morco" lighting fittings profusely illustrated in colour.

Bankruptcy Proceedings

R. J. Horton, 45, Redcliffe Road, Chelsea, electrical engineer, radio dealer, &c., carrying on business at 204, Coldharbour Lane, Brixton, and lately carrying on business at 308, Brighton Road, South Croydon, Surrey, and 25, Chipstead Valley Road, Coulsdon, Surrey.—This debtor attended the London Bankruptcy Court on December 16th for his public examination before Mr. Registrar Kean. Debtor's statement of affairs disclosed liabilities of £3,944 with £2,029 expected to rank, against assets computed to realise £484. In reply to the Official Receiver debtor stated that in 1929 with £150 capital he commenced business at East Dulwich under the style of Aneloy Radio. He sold the business 2½ years later, retaining the lease of the premises. In 1932 he commenced a similar business at Brixton, where he traded under the style of Ronald James. During 1934-35 he obtained employment in the film trade and placed the business under management. The business declined, however, and debtor therefore resumed control in February, 1936. A business opened at Brighton Road, South Croydon, for the distribution of automobile radio sets proved a failure and was closed in February last. In June, 1936, debtor opened another radio business at Coulsdon at a cost of £140, and in October last he sold it for £180. The business at Coldharbour Lane, Brixton, failed to recover its earlier losses and in October last, as a result of pressure by creditors, debtor filed his petition. The examination was closed.

S. L. Bapty and **N. Miles** carried on business in partnership as the Wireless Instrument Mfg. Co., at Avenue Works, Avenue Road, Willesden Junction.—The debtor S. L. Bapty applied for his discharge before Mr. Registrar Kean at the London Bankruptcy Court on December 15th. The Official Receiver reported that the debtors failed in August, 1923, with liabilities of £1,573. The assets had realised £683 and a dividend of 5s. in the £ had been paid. The failure was attributed to depression in trade, lack of capital, and bad debts. The order of discharge was granted subject to a suspension of four months.

S. Patterson, 55, Aberdeen Walk, Scarborough, electrician.—The application for discharge was held at the Court House, Scarborough, on December 14th. The receiving order had been made in 1926. Debtor had attributed his failure to bad trade, pressure by creditors and lack of capital. The discharge was granted subject to six months' suspension.

A. L. J. Stanway, radio dealer, 2, The Arcade, Otley.—Receiving order made December 9th on debtor's own petition.

W. J. Fishbourne, electrical and mechanical engineer, 7, Tynewydd Terrace, Newbridge, Mon.—Public examination January 11th at the Town Hall, Newport (Mon.).

D. P. Phillips, formerly trading as a radio dealer at Cartref, Talog.—First and final dividend of 6⅞d. in the £, payable December 20th at 4, Queen Street, Carmarthen.

W. A. Beaumont, electrical engineer, 44, Warrengate, Wakefield.—Supplemental dividend of 6s. 4½d. in the £, payable December 14th at 13, Burton Street, Wakefield.

W. S. Poole, electrician, High Street, Queensbury, near Halifax.—Receiving order made December 14th on debtor's own petition.

N. Hodgson, electrical engineer, 3, Gurney Street, Middlesbrough.—Receiving order made December 13th on debtor's own petition.

W. H. Hammond, radio and electrical engineer, 18, Church Street, Leamington Spa.—Trustee, Mr. C. J. Band, 9-11, High Street, Coventry, Official Receiver, released December 6th.

S. E. Staines (deceased), lately trading as S. Staines & Son, 480, High Road, Leyton, Essex, electrical engineer.—First and final dividend of 2s. 8½d. in the £, payable at Carey Street, W.C.2.

C. J. Tann, radio engineer, Brianscot, Station Road, Wooton, I. of W., lately trading at 87, High Street, Newport, I. of W.—First and final dividend of 4s. 10d. in the £, payable December 29th at 87, High Street, Portsmouth.

Company Liquidations

Automatic Electrical & Mechanical Controls, Ltd., 268-282, Waterloo Road, London, S.E.1.—A meeting of the creditors was held at the Institute of Chartered Accountants, E.C., on December 15th, when the chair was occupied by the receiver who had been appointed on behalf of the debenture holder on March 29th, 1936. A statement of affairs as at that date was submitted showing liabilities of £1,086, with assets estimated at £877, leaving a deficiency, as regarded the creditors, of £208. That was after allowing for the fully secured creditor who held 5 per cent. debentures and interest amounting to £301. It was stated, however, that the deficiency had been increased to £1,087 by the loss on the trading for the year ended March 29th, 1937. A further note appended to the statement of affairs stated that the company's assets had been sold by the receiver for the debenture holder for £2,150, being a sum sufficient to discharge the debentures and the receiver's trading liabilities. The receiver said that the shareholders had that day met and nominated Mr. G. Jarvis, of 117, Cannon Street, as liquidator, and the creditors would now be asked to confirm that appointment. Mr. Jarvis submitted the statement of affairs and stated that the debentures had been increased to £1,000 since the receiver came into possession. It was resolved to confirm Mr. Jarvis's appointment as liquidator.

A. C. Baker, Ltd.—Winding up voluntarily. Liquidator, Mr. L. C. E. Webber, 64, Gresham Street, London, E.C.

Northampton Radio & Plating Co., Ltd.—Meetings January 19th at 29A, Alington Street, Northampton, to receive an account of the winding-up by the liquidator, Mr. A. W. H. Lenton.

Dissolutions of Partnership

Organ & Webber, radio dealers and repairers and electrical contractors, 42A and 42B, Albany Road, Clive Road and Woodville Road, Cardiff.—Messrs. F. H. Webber and C. C. Organ have dissolved partnership. Mr. Organ will attend to debts and carry on the business.

Havenhand, Lewis & Co., electrical and radio dealers, 104 and 105, Young Street, Sheffield. Messrs. A. Havenhand and J. Lewis have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Airdrie.—A GAS EFFORT.—The Coatbridge Gas Co. has made an offer to the Airdrie Town Council for the purchase of the gas undertaking. The Town Council is faced with the purchase of new plant costing £20,000, and has a total loan debt amounting to approximately the same figure. The Coatbridge Gas Co. has offered to pay off the loan debt. This is on the assumption that the Airdrie Council will not install electric cookers in place of gas in municipal houses, and will retain gas for street lighting during the next ten years.

Australia.—SUPPLY PROGRESS.—The earnings of the Western Australia Government Electricity Supply Department during the year ended June 30th last (£963,062) were £9,754 in advance of the previous year's revenue, but working expenses rose by £29,242 to £267,277. The increase in expenditure was mainly due to the higher cost of fuel, coupled with the more expensive working of the old power station during the construction of the new one. Energy sales (in million kWh) increased by 4.9 to 100.6 (including 61.2 to the Perth Electricity and Gas Department, 10.7 to the Government Tramways, and 9.9 to the Fremantle Municipal Tramways and Electric Lighting Board). The total cost per kWh sold was 0.81d. and the average selling price 0.860d. Coal used per kWh generated amounted to 2.94 lb. The maximum load was 25,500 kW and the load factor 50.7 per cent.

Berwick (Northumberland). — CHANGE-OVER. — The Town Council has decided to ask the Scottish Southern Electric Supply Co., Ltd., to give a definite time when the change-over to a.c. will be completed. The company has informed the Council that the change will be made gradually and that the d.c. system in the centre of the town will be retained for an indefinite period.

Bexhill.—TWO-PART TARIFF.—The adoption of a two-part tariff with a running charge of ¼d. per kWh is recommended by the Electricity Committee.

Blackburn.—AIR RAID WARNING EXPERIMENT.—The first trial air raid alarm was given on December 15th, when three powerful sirens were experimented with at the electricity works. The sirens, all electrically driven, were mounted on a low roof. One was of a 5-h.p. single-note type, another of similar power with a dual note, and the third a large 20-h.p. model with a single note.

Bolton.—BETTER LIGHTING.—The Lighting Committee has decided to make a start with improved street illumination. The installation of sodium lamps in four main roads is to be included in next year's lighting estimates.

Burton-on-Trent.—EXTENSIONS.—The Electricity Committee has approved a mains extension to Ticknall at a cost of £2,000.

Bury St. Edmund's.—PURCHASE NEGOTIATIONS.—The East Anglian Electric Supply Co., Ltd., recently inquired whether the Council was prepared to consider the company's acquiring the borough electricity undertaking. A sub-committee has recently had the matter under consideration and the Council at its last meeting approved the continuance of the negotiations.

Caernarvon.—SEPARATE COMMITTEES.—Separate Gas and Electricity Committees are to take the place of the existing joint committee.

Canada.—EXPORT OF ELECTRIC POWER.—Following a recent Cabinet meeting Mr. Mackenzie King, the Prime Minister, announced that the Dominion Parliament would reassemble on January 27th. He then revealed to the Press that one of the subjects to be taken up would be the export of electric power from Canada to the United States. So far objection has been raised to the demands of both Mr. Hepburn, Premier of Ontario, and Mr. Duplessis, Premier of Quebec, that their provinces should be allowed to export their surplus power to the United States. Under an Act of Parliament of 1906 the Dominion Government has authority to issue or revoke export licences for electric power. The Ontario Hydro-Electric Power Commission may immediately export 110,000 h.p. to the United States without waiting for any approval of its course by Ottawa or the Federal Parliament, according to the *Toronto Globe Mail*.

Carlisle.—MAINS.—The extension of mains to Scaleby Hill, Smithfield, Hethersgill, Lynefoot and Wreay, at a cost of £17,819, is planned by the Electricity Committee.

Darlington.—SUB-STATION.—The Town Council proposes to erect a sub-station in Melland Street.

Dover—METER TESTING.—Tenders are to be invited for the supply of equipment for a meter-testing station, at an estimated cost of £416, subject to the approval of the Electricity Commissioners.

Dundee.—CHARGE FOR REMOVING GAS COOKERS.—Tenants of Corporation houses who want an electric cooker in place of a gas cooker will have to pay 15s. to the Gas Department for the cost of removal and storage.

France.—RURAL SUPPLIES.—A meeting of engineers of rural supply networks was recently held in Paris, when views were exchanged on rural electrification. Monsieur Preaud, Director of Rural Engineering of the Ministry of Agriculture, pointed out that only 2 per cent. of the villages in France were without electricity, but that there remained the problem of supplying isolated buildings and of the development of consumption in places where a network existed. He stressed the advantages of electricity as a source of power for farm work. Individual reports summarised the possibilities of electricity and suggested methods of installation. One of the more interesting communications was that from Mlle. Quintin, director of the School of Agriculture at Coëtlogon, on housekeeping schools. She explained that these schools used a certain amount of electrical apparatus, but villages in which the classes were held did not always have their municipal halls connected to the electrical network and were not always willing to pay for the electricity used. It was felt that the holding of such meetings periodically could do much to help engineers with their rural electrification problems.

Gateshead.—CABLES.—The North-Eastern Electric Supply Co., Ltd., is to lay cables in High Street, Argyle Street, and on the North-Eastern Trading Estate at Team Valley.

Glasgow.—NO COMPENSATION FOR TENANTS.—Following the decision that electric lighting should be installed in all Corporation housing estates the Housing Committee has received letters from tenants of Corporation houses asking for compensation in respect of expenditure incurred by them in having the houses wired. A Tenants' Association has also written asking the Corporation to provide electric fires in the bedrooms of houses which are fitted with plugs for electric fires Both applications have been refused.

STREET LIGHTING.—When asked whether the Lighting Committee had examined the practicability of using electric-discharge lighting, the convener stated that there were at present 3¾ miles of mercury and ¾ mile of sodium electric-discharge lighting.

ILLUMINATIONS.—A scheme for the illumination of George Square, including the floodlighting of the Municipal Buildings, during the Christmas and New Year season has been agreed to by the Finance Committee.

Irish Free State.—ELECTRICITY SUPPLY EMPLOYMENT.—The preliminary report on the Census of Production, 1936, issued recently by the Department of Industry and Commerce, shows that the total number of persons employed by electricity undertakings in 1936 was 3,009, against 2,419 in 1931, salaries paid amounting to £239,755 and £158,811 respectively. Wages paid in 1936 totalled £291,927, against £235,162 in 1931.

India.—HYDERABAD.—New projects for promoting industrial development by means of hydro-electric power are envisaged

Parliamentary News (BY OUR SPECIAL REPORTER)

Wireless in War Time

In the House of Commons on December 5th Mr. De La Bere asked the Minister for the Co-ordination of Defence whether, in view of the importance of wireless and the wireless industry in the event of war, he would state what steps he had taken to ensure that manufacturers of wireless apparatus would be in a position to extend their factories as and when the need arose.

Sir Thomas Inskip said he was advised that, as a result of investigations which had been carried out, it had been found that manufacturing capacity already existed which would be capable of producing the wireless requirements for the defence of this country in war.

The Electricity Distribution Bill

On December 16th Mr. Ede asked the Prime Minister if it was proposed to give the Bill concerned with the supply side of the electrical industry a first reading before the recess, so that its terms might be known to the industry at the earliest date now possible.

Mr. Chamberlain said that it was not. Ample time would, however, be given to the industry to consider the terms of the Bill before it was debated in that House.

Mr. Ede asked if the Prime Minister hoped that this legislation would be passed into law during the current session in view of the delay in introducing it and the magnitude and variety of the interests involved.

Mr. Chamberlain said he was still hoping that it would be passed in the current session.

A Glasgow Protest

On December 21st Mr. Davidson asked the Secretary for Mines if he was aware that the Scottish Coalowners' Committee had again intimated increases in the price of fuel supplies for municipal and public utility undertakings; if he had considered the representations from the Glasgow Corporation Electricity Committee protesting against a further advance of 2s. per ton for next year's supplies and suggesting that the Coal Mines Act should be amended to make it possible for consumers to be represented on the committee empowered to fix prices; and what action did he propose to take.

Captain Crookshank said he was not aware of these price increases, and he had received no representations in the matter from the Glasgow Corporation Electricity Committee. If that Committee considered that the increases were unfair, it should lodge a complaint with the Scottish Committee of Investigation.

in a report submitted by Nawab Shsan Yar Jung Bahadur, chief engineer to the Hyderabad Government. The schemes outlined include utilisation of the waters of the Godavri and Krishna Rivers, enabling 145,000 kW (continuous) to be developed, and additional possibilities include the development of another 70,000 kW from large tributaries, such as the Tungabhadra, Purna, Panganga and Mannar. The anticipated expenditure is about £50 million. Industries which it is hoped to develop with the aid of the new power thus made available include iron ore smelting, aluminium from bauxite deposits, the manufacture of refined oils from local oil seeds and the extraction of gold from the extensive deposits in the Raichur district.

Japan.—FLOODLIGHTING.—In floodlighting public buildings Japanese lighting engineers prefer to light the top of a building or to light a building at the top of a hill so as to obtain the effect of a building in the sky. An excellent example is the new Parliament building in Tokyo where the square cupola at the top has been lighted while the rest of the building is in darkness. Twenty-four projectors with 1,000-W lamps are installed behind the ledges of the roof from which the cupola rises. The result is that the vertical planes are lighted and contrast with the pyramid roof, which is left mainly in darkness. A similar scheme has been used for the lighting of the Nagoya Palace, which stands on the top of a hill. Here the lighting has been thrown on to the building from below by means of 1,000 W projectors which leave the roof in complete darkness and light up only the walls and the decorative scheme on the roof ridges. A picture appears on page 892.

Lampeter.—BETTER LIGHTING—The Town Council has entered into a contract with the West Cambrian Power Co. for the improvement of the street lighting.

Leeds.—SWIMMING POOL HEATING.—It is proposed to heat the water in the Roundhay open-air swimming pool by electricity.

Lerwick.—ELECTRICITY CHEAPER.—The electricity charges have been reduced by ½d. to 6½d. per kWh for lighting and to ¾d. per kWh for power.

Lichfield.—TERMS WITH WALSALL DISAPPROVED.—According to the *Birmingham Post*, representatives of the Walsall Corporation last week interviewed the Electricity Commissioners, who indicated that on financial grounds they would not be prepared to approve of the proposed arrangements whereby Walsall would take over the Lichfield undertaking as from April 1st next at a figure in the region of £160,000. This would give Lichfield Corporation a sum of £60,000 (inclusive of the revenue assets, less liabilities) in excess of the net outstanding indebtedness on capital account as at April 1st, 1938. The officers and workmen of Lichfield Electricity Supply Department at the date of transfer would be transferred to Walsall, or if displaced entitled to compensation, and within five years the rates of charge for electricity to consumers in the Lichfield area would be equalised with the rates of charge in Walsall.

London.—POPLAR.—It is reported that following the recent demonstrations of an electric fish and chip range by John Rouse, Ltd., a 64-kW fryer has been sold to a resident of Old Ford Road and several other local tradesmen have evinced interest in the equipment. Messrs. Rouse also obtained one order and several inquiries from tradesmen visiting the demonstrations from neighbouring boroughs.

SOUTHWARK.—The Electricity Committee is to carry out "free" wiring of premises at an estimated cost of £1,359.

HACKNEY.—In order to afford supplies to the London County Council estates at Pembury Road, the Kingsmead estate and the Morning Lane estate, it is necessary to provide transformer sub-stations the cost of which is estimated at £20,400.

Arrangements have been made for loans of £25,000 for the change-over and £50,000 for generating station extensions.

FULHAM.—The borough electrical engineer reports that it is necessary to reinforce the mains in Effie Road and Harwood Road by laying additional cables, and also to lay a feeder to afford a supply to the London Passenger Transport Board's workshops at Parson's Green. The estimated cost is £1,341. A sum of £370 is also to be spent on reinforcing other feeders in view of the rapid increase in load in the vicinity of Walham Green, and £150 on laying new feeders on each side of the North End Road by-pass.

REVISED CHARGES IN THE CITY.—From next month the City of London Electric Lighting Co., Ltd., is reducing the running charge of the business two-part tariff for lighting, power, heating and approved electrical appliances from ¾d. to ½d., with an annual fixed charge (payable quarterly) of £12 per kW of installed lighting and £2 per kW of installed power and/or heating. Other revised charges are as follows:—Lighting, 600 kWh per annum per kW installed at 4d. per kWh and all in excess at 2d.; power, £2 per annum (10s. per quarter) per kW installed and ½d. per kWh; heating, £2 per annum (£1 per winter quarter) per kW installed and ½d. per kWh.

Lowestoft.—CHANGE-OVER.—The system of supply in the Kirkley Gardens and Laurel Road areas is to be changed over from d.c. to a.c. by the Electricity Committee at a cost of £2,340. The Committee recently received a deputation from the Lowestoft branch of the Wireless Retailers' Association regarding the loss of custom which the retailers are alleged to be suffering owing to the conditions prevailing in change-over areas. The deputation suggested that alterations to radio sets necessitated by the change-over should be carried out locally. The Committee, however, did not see its way to alter its present policy.

Motherwell.—LOAN.—Approval has been given by the Corporation to a recommendation of the Electricity Committee that authority should be granted for the borrowing of £10,000 for apparatus.

Norwich.—METERS.—Sanction is being sought by the Electricity Committee to borrow £25,000 for meters.

Portland.—SUPPLY ARRANGEMENTS.—The Admiralty has approved arrangements for an electricity supply to the radio station and quarters at Portland Bill. The Electricity Committee has agreed terms for a supply to the lighthouse.

Salford.—THE TRACTION LOAD.—Concerned at the reduced consumption of electricity following the substitution of motor-buses for trams on certain services in Salford, the Light, Heat and Power Committee has decided to send a communication to the Transport Committee asking that a deputation should be received to discuss the possibilities of operating trolley-buses.

Seaton Valley.—ELECTRICITY REPLACES GAS.—The Urban District Council is to install electricity in place of gas in 242 houses on the Newtown estate, Cramlington.

[*Elec. Rev.* photo.

At special Christmas demonstrations held at the showrooms of the Brentford and Chiswick Electricity Department, fires and irons (given by Jackson, G.E.C. and Simplex) were presented to the holders of lucky tickets. In the picture the Mayor is seen handing over one of these gifts

Scarborough.—SUPPLY TO HACKNESS.—Consideration is being given by the Electricity Committee to a request for a supply of electricity to Hackness.

PURCHASE OF APPARATUS.—The Electricity Committee is to borrow £20,000 for electrical apparatus to be let out on hire.

Sedgley.—LOAN.—The Electricity Committee is seeking sanction to borrow £3,500 for meters and cookers.

Stoke-on-Trent.—CHARGES FOR SPACE HEATING.—Consideration has been given to supplies for space heating by convectors, and it has been decided that these shall be afforded at ½d. per kWh, provided thermostatic control is employed.

MAINS.—At a cost of £1,400 the Electricity Committee is to extend mains to the Brampton Farm estate.

Swansea.—HIRE OF COOKERS.—Reconditioned cookers and those that have been on hire for a minimum period of one year are to be hired out at charges one shilling lower than for new cookers. The Electricity Committee has also decided that the charges for both new and used cookers shall be reduced by 6d. per quarter upon completion of each year of hire to a minimum of 50 per cent. of the original charges.

DOMESTIC APPARATUS.—Sanction is being sought to borrow £30,000 for domestic apparatus.

Sunderland.—SUPPLY TO PALLION.—A supply of electricity to a suggested new trading estate at Pallion at a cost of £2,150, including new mains and extra switchgear, is proposed by the Town Council.

Taunton.—APPLIANCES FOR HIRE.—The Town Council is applying to the Electricity Commissioners for sanction to borrow £10,000 for capital expenditure on domestic appliances for hire to consumers.

Todmorden.—STREET LIGHTING.—By means of the new sodium lighting in Halifax Road, in the centre of Todmorden, objects on the road or pavements are sharply defined, even at an extreme distance of 300 yd. The installation consists of fluted steel poles, with 16-ft. and 20-ft. extension brackets, equipped with Revo C.9325 silvered mirror reflector fittings and "Philora" 150-W sodium lamps. The lamps are mounted centrally over the 27-ft. roadway at a height of 25 ft. The material was manufactured and installed by the Revo Electric Co., Ltd., under the direction of Mr. E. Brunt, the borough electrical engineer. Tests have been taken of the horizontal ft.-candle intensities, the actual mean test figures being as follows: Maximum, 1.7; minimum, 0.38; and an average of 0.842.

Warrington.—PROPOSED SUB-STATIONS.—Sites for sub-stations at Thelwall and Fearnhead have been purchased by the Electricity Committee.

Weymouth.—EXTENSIONS.—The Electricity Committee is to extend its mains to Littlemoor at a cost of £570, Upwey (£490) and Southdown (£800).

Whaley Bridge.—OVERHEAD LINES TO BE REMOVED.—The application by the Urban District Council for a review of an Order granted to the Trent Valley & High Peak Electricity Co. has succeeded. The Minister of Transport has directed that the lines in Hockerley Lane shall be removed by May 31st. With regard to the lines on the Buxton Road, these require adjustment with the object of reducing interference with the view from the windows of houses, but a decision is postponed until May 31st to enable the company to make such an adjustment in consultation with the Council. Concerning the lines in Macclesfield Road the Minister reserves the power to make a further review of the consent given at any time five years hence.

Wolverhampton.—EXTENSIONS.—It is proposed to extend mains to the Rake Gate estate, Oxley, at a cost of £679 and to the Lane Green estate, Billbrook (£527).

Traction

Australia.—TRANSPORT SYSTEM.—The Western Australia Government trams and trolley-buses carried 30.1 million passengers during the twelve months to June 30th last, against 30.2 millions in the previous year. Electricity consumed (traction) amounted to 10.7 million kWh, or 3.11 kWh per car-mile. The year's working resulted in a surplus of £692, as compared with £1,750 in 1935-36. It is stated that a new central sub-station is urgently required. The existing trolley-bus service operated very satisfactorily, passengers carried numbering 841,000, an increase of 11 per cent. The conversion of the Claremont route to trolley-bus service is expected to be completed by March next.

Cardiff.—LORD MAYOR FAVOURS TROLLEY-BUSES.—The *Passenger Transport Journal* reports that the Lord Mayor advocated the introduction of trolley-buses when speaking at a recent meeting in Cardiff. Referring to the fact that the tramways in certain parts of Cardiff would probably have to make way for a new kind of transport, he said that the advisability of turning over to trolley-buses and not motor-buses should receive consideration. They should, in his opinion, consider using the power that was at their disposal and which used Welsh coal as the means of its proluction, rather than purchase oil from abroad. Oil fuel might cost slightly less, but the return to the city in employment would be sufficient to merit the utilisation of electric power. Prosperity in the past had been achieved by means of coal, and he expressed the opinion that Cardiff's prosperity in the future would depend on coal.

Denmark.—FIRST TROLLEY-BUSES.—Six A.E.C.-English Electric trolley-bus chassis, purchased by the Odense Tramways, were recently shipped to a Danish firm of bodybuilders. The chassis incorporate a dropped front end frame to allow for the fitting of a front-entrance body. Driving power is obtained from an English Electric 65-h.p. motor, and each chassis includes among its accessories a separate air reservoir for the door operating mechanism. These, it is stated, will be the first trolley-buses to be used in Denmark.

Holland.—RAILWAY ELECTRIFICATION.—It is announced that further electrification of the railways in Holland is to be undertaken at a cost of 30 million florins. The money will be provided by the State.

Manchester.—TROLLEY-BUSES IN FEBRUARY.—Alderman Sir William Davy, chairman of the Transport Committee, stated last week that Manchester would have its first trolley-buses in February. The first route will be along Ashton Old Road, and it is possible that the parallel route along Ashton New Road will be available during the same month.

Poland.—WARSAW'S NEW ELECTRIC RAILWAY.—The electrification contract awarded in 1933 to a contractors' committee, on which the English Electric Co., Ltd., and the Metropolitan-Vickers Electrical Export Co., Ltd., were represented, was completed last week, when the 25-mile line between the Polish capital and Minsk Mazowiecki was opened (the first sections from Warsaw to Otwock and Pruszkow were finished last year). British Insulated Cables, Ltd., were the principal sub-contractors in connection with the scheme. According to the Warsaw correspondent of *The Times*, Mr. Piasecki, the deputy Minister of Communications, stated that additional electrification work was contemplated. It is understood that the representatives of the contractors' committee are staying in Warsaw for several days to continue discussions.

Russia.—ELECTRIFICATION OF RAILWAYS.—The aggregate length of the electrified railways in the Soviet Union will soon reach 2,000 kilometres, states the *Monthly Review* of the U.S.S.R. Trade Delegation in the United Kingdom. The work of electrifying the Imandra-Murmansk section is now being completed, and by the beginning of next year all the railways on the Kola peninsula will have been changed to electric traction. The Belovo-Novokuznetzk line of the Tomsk Railway, which is 141 km. long, has been electrified during the current year.

Sweden.—RAILWAY ELECTRIFICATION.—The inauguration of electric traffic on the line between Upsala and Gävle, a distance of 114 km., took place recently, reports *Reuter's Trade Service* from Stockholm. In his inaugural speech the manager of the State Railways, Herr Granholm, said that at first the electrification of the line was not considered likely to become remunerative, because the increased yield would be only 2 per cent. of the capital invested in the electrification, but that the electrification had nevertheless been decided upon in order to provide work. The scheme had now proved a better proposition than was expected owing to the higher coal prices and the increase in traffic, and the profit was estimated at 3.5 per cent. Herr Granholm expressed the hope that the electrification of the northern main line would be continued as far as Boden, on the conclusion of which 60 per cent. of the total length of the State Railways, dealing with 90 per cent. of the whole traffic, would be electrified.

Communications

Great Britain.—POST OFFICE BUSINESS.—A statement issued by the Accountant-General's Department of the Post Office this week shows that transactions during the year ended March 31st last reached the record amount of approximately £992 million, an increase over 1935-36 of £61 million. Inland telegrams increased in number from 44½ to 49¼ million; overseas telegrams from 8¾ to 9¼ million; local telephone calls from 1,732 to 1,882 million; other calls from 88¼ to 99 million; and telephone instruments in use from 2,579,000 to 2,827,000—the largest increase yet recorded.

France.—I.B.U. MEETING.—The International Broadcasting Union has completed a ten days' session at Nice under the presidency of Monsieur Antoine Dubois, delegate of the Dutch broadcasting organisations. Represented at this meeting were twenty-one European States, the Palestine Broadcasting Service, two American broadcasting systems (Columbia and National), the Dutch East Indies Broadcasting Co. and that of Porto Rico. The primary object of the meeting was the preparation and adoption of complementary proposals for the Telecommunications Conference to be held in Cairo next February. The rapid development of short-wave broadcasting has raised increasing difficulties owing to the absence of a rational plan on a world basis and the inadequacy of the wave bands allocated to this service. The number of waves available in these bands, according to the official allocations, is only ninety-one, whereas the number of transmissions actually measured at the Brussels Control Centre has already reached 245 and is continually increasing. During the summer systematic tests organised by the I.B.U., with the collaboration of various laboratories and stations in Europe and North and South America, have provided data about certain of the technical factors such as the efficiency of directional aerials and the possibilities of synchronisation, which will make it possible for the Cairo Conference to study the complete problem of short-wave broadcasting. At the present time seven European countries have arranged nineteen synchronised networks, comprising in all fifty-five stations. This shows the increased efficiency of this system, due to the remarkable progress effected in the method of stabilisation of transmitters, some of which have a frequency tolerance of as little as one part in ten millions. As the new building for the Brussels Control Centre is nearly finished the Technical Commission examined and approved the final details of its equipment with a view to increasing the efficiency of this very important international service—every day nearly eight hundred frequency measurements on long, medium and short waves are carried out at the Centre.

Supervisors' Competition

THE examining board has now announced its decision in connection with the W. E. Highfield Shield Competition, 1937, held under the auspices of the Association of Supervising Electrical Engineers. The shield was presented for competition by Mr. W. E. Highfield when president of the Association in 1923, and the competition has been held each year since that date. In addition to the shield three prizes, from £2 2s. to £5 5s., are offered in the members' section, and two prizes, one of £3 3s. and one of £2 2s., in the associates' section. On this occasion the number of competitors was higher than last year in both sections. The awards of the examining board are as follows:—Members' section (shield and first prize of £5 5s.): Mr. W. J. F. Kirkaldy, Wolverhampton, for his paper "The Application of Electricity and the Value of the Industry to the Development of Modern Aviation." Second prize (£3 3s.): Mr. G. Grainger, Walsall, for his paper "A Collection of Original Data relating to Plant Performance." Third prize (£2 2s.): Mr. W. Acton, London, for his paper "The Diagnosis and Cure of Faults in Electric Machines." Associates' section: First prize (£3 3s.): Mr. L. M. Bruce, London, for his paper "Fire Fighting Control." Second prize (£2 2s.): Mr. H. E. St. Pierre, London, for his paper "A Good Load for the Rural Supply." The shield and prizes were presented to the successful competitors by the president of the Association, Mr. J. R. Beard, M.Sc., M.I.E.E., at the Association's meeting held at the E.L.M.A. Lighting Service Bureau on December 21st. The examining board was composed of Messrs. H. Hobson (immediate past-president), W. E. Highfield (past-president), J. M. Crowdy (past-chairman of the Association), and W. Lang (past-member of the Executive Council).

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—December 27th. Works Department. Various articles, including electrical fittings, for one year. City Engineer's Office.

Aberystwyth.—January 18th. Electricity Department. Kiosks and sub-station equipment. (December 17th.)

Alva.—Town Council. Electric lighting at twenty-four houses on the Braehead housing estate. T. J. Y. Brown, 1, Pitt Terrace, Stirling.

Australia.—MELBOURNE.—January 18th. State Electricity Commission of Victoria. Cables. (T. 31312/37.)*
February 1st. Two 35,000-kVA transformers. (T. 31186/37.)*

Birmingham.—January 12th. Salvage and Stables Committee. Forty-six lead plate batteries for electric vehicles. (See this issue.)

Brierley Hill.—January 27th. U.D.C. One centrifugal-type sewage pump, capable of delivering 20,000 gal. per hr., together with electric motor and equipment and accessories, for the Wordsley pumping station, near Stourbridge. Fiddian & Deeley, Council's engineers, 13, Church Street, Stourbridge (deposit £3 3s.).

Cardiff.—January 17th. Electricity Department. 33,000-V and other p.i. cables and one 7-panel, 6,600-V, 350,000-kVA rupturing capacity switchboard. (See this issue.)

Dartford.—January 22nd. Borough Council. Electric van. (See this issue.)

Driffield (EAST YORKS).—January 11th. R.D.C. Electrically driven pumping machinery at the Hutton pumping station and the booster stations at Garton and Wetwang. (December 10th.)

Eastbourne.—January 14th. Electricity Committee. Electrical materials for twelve months; also wiring for hire and hire-purchase apparatus for assisted wiring installations. (December 17th.)

Edinburgh.—Department of Agriculture for Scotland. Electrical work at houses and steadings, &c., in land settlement scheme at Drem. Applications to tender to chief engineer and surveyor, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, 2 (deposit £1 1s.).
December 27th. Corporation (Electricity Supply). Electric lighting and power in Craigentinny House. Engineer's Office, Dewar Place (deposit £1 1s.).

Egypt.—CAIRO.—January 17th. Ministry of Public Works (Mechanical and Electrical Department). One 25-kW oil-engine driven generating set, one 5-kW 220-V d.c. generator, switchboard, cable, accessories, &c., for the extension of the power station at the Valley of the Kings, Luxor. (T. 31725/37.)*

Epsom and Ewell.—December 28th. Electricity Department. L.v. cable. (December 10th.)
January 17th. Oil-immersed transformers and h.v. switchgear. (See this issue.)

Fife.—January 5th. County Council. Electric lighting at Kincardine-on-Forth housing estate. C. R. Douglas & Son, East Port, Dunfermline (deposit £1 1s.).

Heston and Isleworth.—January 6th. Electricity Department. Cables, switchgear, protective relays and potential transformers. (See this issue.)

London.—BETHNAL GREEN.—January 14th. Electricity Department. Electric van. (See this issue.)

Manchester.—January 5th. Highways Committee. 183 one-way illuminated (external floodlight) traffic signs for one-way traffic scheme. Highways Department (District Surveyor's Office), Town Hall (deposit £1 1s. to the city treasurer).

Merton and Morden.—December 29th. U.D.C. Vehicle actuated traffic signals in Merton High Street. (December 17th.)

Montrose.—December 31st. Town Council. Electric lighting work at North Street and Queen Street housing estates. Burgh surveyor.

Newport (MON).—January 3rd. Corporation. Electrical installation at the Maindee Baths. (December 10th.)
December 30th. 9,500 electric lamps for street lighting and other purposes. A. Nichols Moore, borough electrical engineer, Electric House, Dock Street.

New Zealand.—WELLINGTON.—January 18th. Public Works Department. One outdoor-type, 100-A, 11,000-V, pole-mounted oil-circuit breaker, complete with shunt trip coil and current transformers, &c. (T. 31750/37.)*
February 22nd. Post and Telegraph Department. Insulated copper wire. (T. 31758/37.)*
February 25th. Cable. (T. 31756/37.)*
CHRISTCHURCH.—February 15th. Electricity Department. Sub-station switchgear. (T. 3753/37.)*

Pembroke.—January 4th. Borough Council. Electrically driven unchokeable, centrifugal type, automatically operated pumping sets, all in duplicate, and one oil-engine driven standby unit, together with incidental works, at Pembroke and Pembroke Dock. A. P. J. Cotterell & Son, 54, Victoria Street, London, S.W.1 (deposit £2 2s.).

Portland.—December 27th. U.D.C. Cable, joint boxes and cover boards or tiles. (December 10th.)

Salford.—January 12th. City Council. One 15,000-kVA transformer, fitted with automatic on-load tap changing equipment. (December 17th.)
January 14th. One 75-kW mercury-arc rectifier. (See this issue.)

Sheffield.—January 10th. Electricity Committee. Natural draught cooling tower. (December 10th.)

Shipley.—January 8th. U.D.C. Electric lighting in thirty-four houses. H. Dawson, surveyor and architect, Town Hall.

South Africa.—BLOEMFONTEIN.—January 3rd. Electric Supply Department. E.h.v. and h.v. switchgear, three 500-kVA and three 250-kVA transformers and p.i., l.c. cable. (T. 28916/37.)*
KRUGERSDORP.—January 3rd. Electricity Department. Four three-phase, oil-filled, indoor type transformers. (T. 28932/37.)*
JOHANNESBURG.—January 24th. Railways and Harbours Administration. One 90-ft. electrically driven turntable, complete with motor. (T.Y. 28930/37.)*
January 19th. City Council. 120 300-A and thirty 100-A distribution fuse units, equipped with glazed porcelain cartridge fuse carriers, and 504 cartridge fuses, together with spare fuse carriers and metering sockets or test plugs. (T. 31603/37.)*
PRETORIA.—January 20th. Union Tender and Supplies Board. 150-kVA transformer, l.v. switchboard, h.v. switchgear and cable. (T.Y. 31597/37.)*
PORT ELIZABETH.—January 27th. Municipality. One 4,000-kVA transformer, ten 22,000-V, three-phase circuit-breakers and one ring main unit; also l.c. and armoured cable, cable end boxes, joints, &c. (T.Y. 31398/37.)*
DURBAN.—January 21st. Electricity Department. Six e.h.v. metal-clad, three-phase switch panels and six single- or two three-phase reactors. (T.Y. 31591/37.)* Six e.h.v. pedestal-type, metal-clad switch panels. (T.Y. 31854/37.)*
January 7th. City Council. Four electric carcase saws for the municipal abattoir. (T. 31734/37.)*

Southampton. — January 18th. Electricity Department. Motor-driven boiler feed pump. (See this issue.)

Uruguay.—MONTEVIDEO.—January 28th. State Electricity Supply and Telephones Administration. Twenty-six three-phase, oil-cooled, static transformers. (T.Y. 31390/37.)*

Wallasey.—January 18th. Borough Council. P.i., l.c. cables. (December 10th.)

Walton and Weybridge.—January 10th. U.D.C. Electricity Department. One transformer kiosk, e.h.v. switchgear and ring main controller; also l.v. feeder pillars and two 300-kVA transformers. (December 17th.)

West Hartlepool.—Town Council. Electrical installation at the new Brinkburn secondary school. F. Durkin, borough engineer, Town Hall.

Whitworth.—January 10th. U.D.C. Electricity Department. Sub-station control switchgear to operate at 6.6-kV, consisting initially of five panels with truck-type cubicles; 6.6-kV p.i. l.c. cable; and alterations to existing 6.6-kV feeders. (See this issue.)

Worthing.—January 3rd. Borough Council. Street lighting equipment, including concrete lamp columns and time switches. (December 17th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Alyth (PERTHSHIRE).—Town Council. Accepted. Street lighting equipment.—G.E.C.

Barrow-in-Furness. — Electricity Committee. Accepted. Thirty-three concrete lamp columns (£5 1s. each).—Concrete Utilities, Ltd.

Bedford.—Electricity Committee. Recommended. Supplies for twelve months:—Meters.—Ferranti, Ltd.; Met.-Vick. Elecl. Co.; Chamberlain & Hookham; Venner Time Switches. Cooker control units and meter boards.—W. H. Holland. Kettles.—Drake & Gorham (Wholesale). Cookers.—Jackson Electric Stove Co.; Revo Electric Co.

Dartford.—Electricity Committee. Accepted. Cooker wiring and wiring under the assisted scheme.—W. J. Bayliss.

Hyde.—General Purposes Committee. Accepted. Electrical installations at market premises and police sub-station.—Johnson & Turner. Electrical installations at houses on the Back Bower & Benett estates.—Mould & Corlett.

Lanarkshire.—County Council. Accepted. Electric lighting installation at forty-four houses at Holytown.—J. S. Denholm.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in block 1 of dwellings on the Eastney Street area, Greenwich:—

	£		£
Archibald Meckhonik. Accepted	**814**	Coleby & Co.	958
Jacob, White & Co.	861	Jones and Jennings	967
South Metropolitan Electric Light and Power Co.	867	Middlesex Electrical Co.... ...	1,019
Carr Bros....	871	Alexander Hawkins & Sons ...	1,093
A. J. Hewens & Sons	957	E. C. Sparkes & Co.	1,212

POPLAR.—Contracts Committee. Recommended. 500 electric kettles (£625).—Bulpitt & Sons. Transformer oil filter (£224).—Stream-Line Filters.

STEPNEY.—Electricity Supply Committee. Recommended. Supplies during the year ending December 31st, 1938: 5-A single- and two-way switches (£402).—C. H. Parsons, Ltd. Cooker control units (£1,008).—M. K. Electric, Ltd.
Vulcanised i.r., 250-A Association-grade cable:

	£		£
Wholesale Fittings Co. Recommended	**597**	Hackbridge Cable Co.	651
Mersey Cable Works, Ltd. ...	613	Crompton Parkinson	1,266
W. Geipel, Ltd.	638	St. Helen's Cable and Rubber Co.	1,381

Tough rubber-sheathed cable:

	£		£
W. Geipel, Ltd. Recommended	**2,368**	Hackbridge Cable Co.	3,659
Wholesale Fittings Co.	2,476	Crompton Parkinson	7,382
Mersey Cable Works	2,913	St. Helen's Cable and Rubber Co.	7,475
Metropolitan Electric Cable and Construction Co.	3,479		

Recommended. Washboilers during the period ending October 31st, 1938 (£625).—Brailsford Bros. Twelve weldless steel tubular lamp columns (£132).—B.T.H. Belt coal conveying plant, together with a drag scraper, in connection with the arrangement for the existing coal store at the Limehouse generating station and the extensions thereof:

	£		£
International Combustion, Ltd. Recommended	**15,360**	Mitchell Engineering, Ltd. ...	15,705
		Babcock & Wilcox, Ltd. ...	22,468

Recommended. Equipment and services required in connection with the change-over of consumers' apparatus from d.c. to a.c. in the Whitechapel area: Eleven rectifiers (£120).—Westinghouse Brake & Signal Co. Firty-two motors complete with starting equipment (£560).—B.T.H. Five totally enclosed rotor starters (£36).—Premier Electric Co. Changing of specialised motor units, &c.—Collins Electrical Co. (£951); City Electrical Co. (£1,473). Conversion of radio apparatus (£79).—Radiomenders, Ltd.

Middlesex.—Education Committee. Recommended. Electrical installation at Technical Institute, Hendon (£5,548).—Colston Electrical Co.

County Council. Accepted. Automatic telephone cables at Shenley Mental Hospital (£1,259).—Ericsson Telephones, Ltd.

Portland.—Housing Committee. Wiring sixty-two Council houses:

	£		£
R. L. Weyman. Accepted ...	**408**	Bennett and Escott	510
Davis and Hadley	490	Marshall & Son	646
W. O. Knell	504	R. F. Webb	688

Electricity Committee. Accepted. Electric fires.—Berry's Electric.

Sutherland.—County Council. Accepted. Electric lighting installation at thirty-two houses at Brora.—A. S. Addison.

Swansea.—Borough Council. Accepted. Switchgear for power station (£4,746).—Ferguson Pailin. Switchgear for the works of the Magnesium Corporation, Ltd. (£4,246) and test room equipment (£745).—Met.-Vick. Electl. Co.

Tynemouth.—Housing Committee. Accepted. Electrical installation at 248 houses on the Ridges estate (£1,084).—F. Gray.

Weymouth.—Development Committee. Electric sluices and tide flaps:

	£		£
Glenfield and Kennedy. Accepted	**1,606**	Ham, Baker & Co.	2,060
Blakeborough & Sons	2,056		

Housing Committee. Accepted. Electrical installations at Council houses.—Tout & Co. (£52); W. O. Knell (£163); Davis & Hadley (£127).

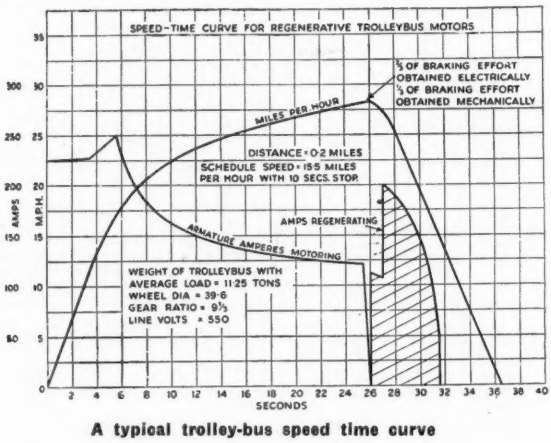
Notes

Light and Colour

The second series of annual lectures to young people (between ten and sixteen years of age) entitled the "John H. Holmes Memorial Lectures," will be delivered by Professor W. E. Curtis at King's College, Newcastle-upon-Tyne, on January 5th, 6th and 7th. The subject is to be "Light and Colour" and appropriate experiments will be carried out. Adults can be admitted only if accompanied by children. Tickets and further particulars can be obtained from the chief clerk, King's College, Newcastle-upon-Tyne.

The Trolley-bus and its Equipment

A booklet of forty pages on the trolley-bus and its equipment has been issued by the Metropolitan-Vickers Electrical Co., Ltd. Following a review of the development of passenger transport by road during the past forty years, which leads up to a statement of the advantages of the trolley-bus, an account


SPEED-TIME CURVE FOR REGENERATIVE TROLLEYBUS MOTORS
⅔ OF BRAKING EFFORT OBTAINED ELECTRICALLY
⅓ OF BRAKING EFFORT OBTAINED MECHANICALLY
MILES PER HOUR
DISTANCE = 0·2 MILES
SCHEDULE SPEED = 15·5 MILES PER HOUR WITH 10 SECS. STOP
AMPS REGENERATING
ARMATURE AMPERES MOTORING
WEIGHT OF TROLLEYBUS WITH AVERAGE LOAD = 11·25 TONS
WHEEL DIA = 39·6
GEAR RATIO = 9⅔
LINE VOLTS = 550
AMPS
M.P.H.
SECONDS

A typical trolley-bus speed time curve

is given of the principal features of trolley-bus operation, a description of the equipment and data on performance characteristics. Though including much technical information, this small book is written in such a way as to be intelligible to the layman, and it is well illustrated, the diagrams relating to regenerative characteristics, rheostatic braking and radio interference suppression being of especial interest.

Christmas Engineering Lectures

The Engineering Public Relations Committee, which consists of representatives of the leading engineering institutions, has arranged for two Christmas lectures to be delivered in the I.E.E. Lecture Theatre on January 7th and January 10th, at 3 p.m., by Prof. C. E. Inglis, on "Building Big Bridges." The audiences will be limited as far as possible to youths between the ages of 15 and 20 years, admission being by ticket only, obtainable in advance. Members of the Institution of Electrical Engineers who require tickets should apply for them as soon as possible to the Secretary.

Installations in Places of Entertainment

In a recent report the Entertainment Committee of the Middlesex County Council states that the improvement in the standard of electrical installations in places of entertainment noted in previous years has been maintained, especially in the case of cinemas. The installations in a number of the older type of premises, particularly church halls, although not dangerous, still leave something to be desired. There is, however, an upward tendency and much improvement has been carried out on a voluntary basis. The electrical heating and ventilating installations in the new cinematograph theatres are increasing in size and complexity, and it has been found necessary to make more frequent inspections during the construction of the premises to facilitate compliance with the regulations. As a result of this and the increase in the number of premises it has been necessary to increase the staff of the electrical section by the appointment of an additional electrical inspector. There has been a growing tendency on the part of supply authorities to install oil-cooled transformers and switchgear in sub-stations inside cinematograph theatres, not only for the requirements of the building, but for a large number of external consumers. This question has been referred to the Home Office and at the request of H.M. Senior Electrical Inspector of Factories conferences have recently been held at the Home Office regarding the matter, when technical officers of London and Surrey were also present. The Home Office may impose certain restrictions regarding the construction of sub-stations in cinematograph theatres and the capacity and design of transformers and switchgear. With regard to heating and ventilating installations it has been a requirement of the Committee during the past few years that an adequate volume of fresh air, efficiently cleansed and humidified, should be provided in new cinemas, and tests are now being made before the opening of all new premises to ensure that these requirements are complied with. As previously reported, there are now no cinemas in the county without some form of mechanical ventilation. In a number of the older premises it would be difficult to install a plenum plant with air washer owing to site restrictions, but in many cases the owners have voluntarily improved the ventilation as it is now generally appreciated that it is good business to provide the public with efficient heating and ventilation.

E.A.W. Activities

The Electrical Association for Women's affiliation scheme for schools is growing in popularity and schools from all parts of the country are now participating. Thirty-one entries were received this year for the Lady Mount Temple Cup, the subject of the essay being "The Place of Electricity in a Fitter Britain."

The Electrical Engineers' Ball

The next Electrical Engineers' Ball will be held, as already announced, at Grosvenor House, Park Lane, W., on Friday, February 11th, 1938 (8.30 p.m. for 9 p.m. Supper 11.30 p.m. Carriages 3 a.m.), the day after the annual dinner of the Institution of Electrical Engineers. We are asked to state that the ball will be organised on the same lines as last year and that tickets are now available. As usual, they are obtainable, price one guinea each, from members of the General Committee, who number seventy-eight, and include the members of the Committee of Management of the I.E.E. Benevolent Fund, under whose aupices the ball is managed. The Executive Committee is as follows:—Mr. H. P. Gaze, Mr. W. G. Hendry, Mr. C. W. Hill, Mr. J. M. Kennedy, Mr. J. W. Leach, Sir George Lee and Mr. J. W. J. Townley.

Midland Electrical Engineers' Ball

The Midland Electrical Engineers' Ball Committee has sent to the Institution of Electrical Engineers' Benevolent Fund a contribution of £65 as a result of the Ball held in November.

Appointments Vacant

Assistant, Grade II, for the Royal Aircraft Establishment, South Farnborough.

Draughtsman for the Salisbury Electricity Department, S. Rhodesia.

Meter fixer and installation tester and canvasser-salesman for the Spalding U.D.C.

Electrical engineer and manager for Ruthin Electricity Department.

Consumers' record and statistics clerk for Bethnal Green Electricity Department.

Station engineer for Bolton Electricity Department.

(See our Classified Advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

At the meeting of the Institution of Electrical Engineers in London on December 16th, the portrait of **Mr. Sydney Evershed** was presented to the Institution. The President, Sir George Lee, was in the chair, and there was a large attendance of friends of Mr. Evershed to welcome him. Lieut.-Col. W. A. Vignoles, in making the presentation of the portrait to the Institution, said it was in 1886—over fifty years ago—that Mr. Sydney Evershed applied to the firm of Goolden & Trotter for employment. The "Trotter" was Mr. A. P. Trotter, afterwards electrical adviser to the Board of Trade and still a member of the Institution. Mr. Evershed had already acquired a considerable knowledge of electricity from experimental work which he had carried out with home-made apparatus, and he was engaged as manager of the Instrument Department, employing half a dozen men in premises in Westminster. Mr. Evershed would probably be best known as the inventor of the "Megger," but he had also carried out a great deal of scientific work, the results of which were set out in papers read before the Institution. Col. Vignoles said it was appropriate that he himself should make this presentation, as he had worked under Mr. Evershed as a pupil and was now associated with him again in Evershed & Vignoles, Ltd., of which Mr. Evershed was chairman. To mark in some permanent manner Mr. Evershed's golden jubilee and his work for electrical science and industry, it was decided to commission Mr. George Harcourt to paint his portrait for presentation to the Institution. The 400 subscribers included friends associated with Mr. Evershed in the past, shareholders of the company, directors, members of the technical and clerical staffs, and employés of the company. The President, expressing the pleasure which it gave the Institution to accept the portrait, recalled that Mr. Evershed had been a member of the Institution for fifty-one years and had served on the Council for fifteen years, for three of which he was vice-president. Mr. Evershed expressed his thanks for the appreciative remarks that had been made concerning him, and gave some of his reminiscences of the past fifty-one years.

A portrait of Mr. Sydney Evershed by Mr. George Harcourt, which has been presented to the I.E.E.

Mr. C. R. Belling, who has given £5,000 to start a pension fund for his company's employés **(See p. 902)**

Mr. J. Grossett has been appointed manager of the Arbroath Electric Light & Power Co., Ltd., and district manager for the Grampian Electricity Supply Co., in succession to the late Mr. J. Cathcart Christie. Mr. Grossett was educated at Arbroath High School. He served his apprenticeship with Maxwell's, Ltd., electrical engineers, Dundee, and studied for three years at Dundee Technical College. For a short time he was with Ferranti, Ltd., and in 1928 he entered the service of the Grampian Electricity Supply Co. as a member of the company's engineering staff at Arbroath, and held the position of assistant to Mr. Cathcart Christie.

Mr. J. M. Bowman, chief electrical engineer of the Rhondda Urban District Council, has been presented with an inscribed group photograph, a silver cigarette case, and a fishing rod by the staffs of the electrical, destructor, and asphalt plant departments of the Council on his retirement after twenty-four years' service.

Mr. H. J. Suggars, one of the early X-ray pioneers at the London Hospital, is retiring at the end of this month, and in the New Year he will undergo an operation to restore his failing eyesight. Mr. Suggars has suffered severely from X-ray dermatitis, which has attacked his face and chest. For twenty-three years he acted as X-ray operator, and since 1924 he has been chief of the hospital's photographic department.

Mr. R. Jackson has resigned his position as secretary of Mawdsley's, Ltd. **Mr. J. M. Campbell** has been appointed secretary in London, and **Mr. J. Taylor** as local secretary in Dursley.

Sir Ambrose Fleming, F.R.S., who invented the thermionic valve, has been made an honorary life fellow of the Royal Society of Arts in recognition of the many services he has rendered to the Society during the past fifty years.

Mr. L. G. Reid has been appointed general manager of the Loughborough works of the Brush Electrical Engineering Co., Ltd., and commences in the New Year, while **Mr. A. P. Thomas** has taken over the duties of works manager.

Mr. W. T. Tallent-Bateman, accompanied by Mrs. Bateman, will be sailing for South Africa on the *Dunvegan Castle*, leaving Southampton on January 7th. Mr. Bateman will represent the interests of Ferguson, Pailin, Ltd., with that company's recently appointed South African agents—Rice & Diethelm, Ltd., P.O. Box 930, 86, Standard Bank Chambers, Commissioner Street, Johannesburg.

Mr. F. Cooper, for many years principal assistant with Kincaid, Waller, Manville and Dawson, consulting engineers, who became a partner to the late Mr. A. E. Jackson, whose death we record in our Obituary section to-day, will continue the business as hitherto.

Mr. E. Graham Clark, M.C., B.Sc., whose appointment as secretary of the Institution of Civil Engineers was announced in our last issue, was educated at Felsted School and Armstrong College, Newcastle-on-Tyne, where he obtained the degree of B.Sc. (Civil Engineering), Durham University. He received his practical training as an apprentice at the works of Ernest Scott & Mountain, electrical and mechanical engineers, of Gateshead-on-Tyne, and subsequently as a pupil, and later as an assistant, to Mr. J. Mitchell Moncrieff, consulting engineer, Newcastle-on-Tyne. After war service with the 50th (Northumbrian) Division he became chief technical assistant at the Institution of Civil Engineers and served as secretary on a number of technical committees, later becoming chief assistant. Since the time when the late Dr. Jeffcott, whom he succeeds as secretary, was taken ill some two years ago he has been acting as secretary.

Mr. J. K. Clark, Grad.I.E.E., has been awarded a John Speaks Foundation Scholarship in Spanish, and leaves next month for Argentina, where he will be attached to the Buenos Aires office of the Metropolitan-Vickers Electrical Export Co. for a period of eight months. Mr. Clark graduated first class B.Eng. at Sheffield in 1935, and on leaving the University obtained a post in the London office of Siemens-Schuckert as technical sales engineer. Six months later he joined the Metropolitan-Vickers Electrical Co. for a course of practical training, and has spent eighteen months in various departments, both in Manchester and Sheffield. During last summer he spent five months on the Continent to extend his knowledge of German, and paid visits to works and power stations all over the Continent. On his return to England two months ago he rejoined the Metropolitan-Vickers Electrical Co. as junior engineer in the Motor Department.

Mr. J. K. Clark

Mr. Vernon C. Botham has resigned the position of borough electrical engineer to the Ruthin Corporation and has been presented with a suitably inscribed chiming clock by members of the Electricity Department. Mr. Botham is taking up an appointment at Yeovil with the Wessex Electricity Co. He had previously been for many years with the Edmundson group.

Mr. T. H. Watson, first assistant to the meter superintendent of Norwich Corporation Electricity Department, has been appointed meter engineer at Kettering.

Mr. F. S. Ette has been elected president of the Birmingham Electric Club for the ensuing session. The vice-presidents are Messrs. J. Hamilton and J. W. Donovan.

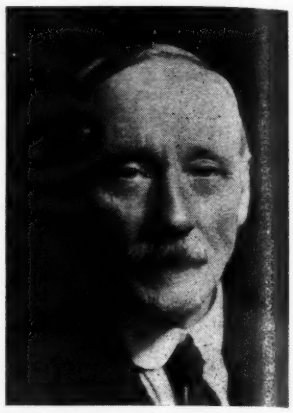
Obituary

Ald. Francis Hugh Thornton, chairman of three electricity supply companies, died at his home, Kingsthorpe Hall, Northampton, on December 19th at the age of eighty-four. He was one of the founders of the Northampton Electric Light and Power Co. in 1889, and a director from that date, becoming the company's second chairman in 1896. He took part in the founding of the Rushden and District Electric Supply Co. sixteen years later and was elected chairman. In 1919 the Northampton undertaking took over the Wellingborough Electric Supply Co. and he was appointed chairman. He has continued in each of these offices ever since.

Mr. R. L. Gamlen.—The death occurred suddenly on December 19th at Famagusta, Cyprus, of Mr. Robert Loraine Gamlen, O.B.E., M.I.E.E. (aged 63), who was formerly Mint-Master at Hyderabad, Deccan, and was Director of H.E.H. Nizam's Electricity Department. He was an electrical and mechanical engineer, and the son of Mr. R. H. Gamlen. He was trained at the City and Guilds College and at Faraday House.

Mr. N. A. Hardie.—We regret to learn of the death of Mr. Norman A. Hardie, general manager (sales) of the Associated Equipment Co., Ltd., which occurred on December 16th, at the age of forty-three. Mr. Hardie was appointed joint manager (commercial) of the A.E.C. in 1925, and upon the amalgamation of the Daimler Co., Ltd., with the A.E.C. he was appointed general manager of the Associated Daimler Co., Ltd. Mr. Hardie had travelled extensively in connection with the development of A.E.C.'s overseas business.

Mr. A. E. Jackson.—We regret to record the death of Mr. Alfred Edward Jackson, M.I.E.E., consulting engineer (Kincaid, Waller, Manville & Dawson), which occurred on December 17th at Cheam, Surrey. Mr. Jackson was partner in the firm for many years, and when, in 1931, the partnership between him, Sir Edward Manville, Sir Philip Dawson, and Mr. H. G. Simmonds was dissolved, Mr. Jackson continued in practice on his own account under the same style. Mr. Jackson was largely responsible for carrying out various engineering works at home and abroad, including power stations, electric tramways and railways, harbours, etc. He specialised in the design of power stations and distribution systems, and his work in this direction included the construction, inspection, testing and general supervision of the generating and other plant ordered in this country for the Melbourne and Adelaide Electric Supply Companies, for which his firm has acted as London consultants for many years past. Mr. Jackson also assisted Sir Philip Dawson both in the original work of electrifying the suburban lines of the London, Brighton and South Coast Railway, and also later in the preparation of the electrification reports which Sir Philip Dawson presented to the Great Western, London and North-Eastern, and Caledonian Railway Companies. He also prepared the original scheme for the Jerusalem public electricity supply.



[Elliott & Fry.
The late Mr. A. E. Jackson

Will.—Sir John Dewrance, head of Dewrance & Co., and late chairman of Babcock & Wilcox, Ltd., left £392,609, with net personalty £235,657.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Britannia Distributors, Ltd.—Private company. Registered December 15th. Nominal capital, £100. Objects: To carry on the business of manufacturers and distributors of and dealers in electric accessories, devices, fittings, fancy goods and novelties, &c. The directors are: F. J. Delbeke, "Erinsdale," Tenterden Grove, Hendon, N.W.4; W. W. Kublin, 14, Roehampton, S.W.15; and J. Matson, 17, Monahan Avenue, Purley, Surrey (managing director, director and secretary, respectively, of Britannia Electric Lamp Works, Ltd.). Registered office: 92-94, Paul Street, E.C.2 .

North Cheam Radio, Ltd.—Private company. Registered December 16th. Capital, £250. Objects: To carry on the business of sellers and retailers of radio receivers and all parts thereof, electrical equipment and appliances, &c. The directors are: A. E. Green and Mrs. A. M. Green, both of 130, Oaks Avenue, Worcester Park, Surrey. Secretary: A. E. Green, Registered office: 204, London Road, North Cheam, Surrey.

Seddon & Torrance, Ltd.—Private company. Registered December 17th. Capital, £2,000. Objects: To carry on the business of electricians, mechanical engineers, suppliers of electricity for light, heat, motive power, automobiles or otherwise, &c. The permanent directors are: L. Seddon, 4, Bancroft Avenue, Cheadle Hulme, Ches; and W. Torrance, 282, Upper Brook Street, Manchester. Registered office: 228, Upper Brook Street, Manchester.

Intel Interior Electric Heating Co., Ltd.—Private company. Registered December 15th. Capital, £5,000. Objects: To carry on business as manufacturers of and dealers in certain articles under the name of "Intel" in respect of which an application No. 581806 for registration of a trade mark has been lodged by J. E. Barrier and that of heating and ventilating, and fire protection experts and advisers, manufacturers of and dealers in radiators, stoves, ranges and cooking, heating, ventilating and temperature control plant, &c. The subscribers are: H. Blackman, 123, Wellington Avenue, Sidcup, Kent; and H. F. Morling, 64, King's Avenue, New Malden. Solicitors: Mayo Elder & Co., 10, Drapers Gardens, E.C.

Queensbury Engineering Co., Ltd.—Private company. Registered December 13th. Capital, £5,000. Objects: To carry on the business of sign manufacturers and dealers in road service signs and equipment, electric advertising clocks and office clocks, &c. The directors are: R. W. Seear and F. Seear, both of 52, Fairfield Avenue, Edgware, Mdx. Registered office: Cumberland Road, Stanmore, Mdx.

Ernest W. Williams, Ltd.—Private company. Registered December 15th. Capital, £1,000. Objects: To carry on the business of manufacturers of, agents for and dealers in radio and television sets, accessories and apparatus, electrical fittings, &c. The permanent directors are: E. W. Williams and Mrs. K. Williams, both of 142, Church Road, St. Annes, Lytham St. Annes.

Sussex District Radio Service, Ltd.—Private company. Registered December 9th. Capital, £500. Objects: To acquire the business of radio service, repairing and advisory engineers, manufacturers, dealers and agents and general electrical and engineering works now carried on by F. D. Crafter as the Sussex Radio Service at 53, Dyke Road, Brighton, or elsewhere. The directors are: F. D. Crafter, "Barry," London Road, Withdean, Brighton, and five others. Secretary: C. H. Tyson, B.Sc., F.C.A. Registered office: 1, Castle Square, North Street, Brighton.

Everyday (Radio), Ltd.—Private company. Registered December 8th. Capital, £500. Objects: To carry on the business of dealers in and hirers and repairers of all kinds of radio and television apparatus, gramophones, &c. The first directors are: S. A. S. Goodwin, C. L. Burton and T. C. Johnson. Registered office: 641a, Fulham Road, S.W.6.

Leigh Radio Services, Ltd.—Private company. Registered December 15th. Capital, £1,000. Objects: To acquire the business of Leigh Radio Services carried on by Sabary Lloyd at 53, Railway Road, Leigh, and to carry on the business of manufacturers of and dealers in radio and television sets, &c. The directors are: Mrs. S. Lloyd and E. Lloyd, both of 20, Greenleach Lane, Worsley. Secretary: A. Lloyd. Registered office: 53, Railway Road, Leigh, Lancs.

Returns of Electrical Companies

Skipton Wireless Service Co., Ltd.—Capital, £500 in £1 shares. Return dated October 25th, 1937. 102 shares taken up. £102 paid. Mortgages and charges, nil.

Killamarsh and District Electric Supply Co., Ltd.—Capital, £6,000 in £1 shares. Return dated September 21st, 1937. 4,725 shares taken up. £4,725 paid. Mortgages and charges, nil.

Gilbey Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated September 1st, 1937. All shares taken up. £2 paid. £1,998 considered as paid. Mortgages and charges, nil.

Pearce Signs, Ltd.—Capital, £10,000 in £1 shares. Return dated August 12th, 1937. 2,700 shares taken up. £2 paid. £2,693 considered as paid. Mortgages and charges, nil.

Claude Lyons, Ltd.—Capital, £500 in £1 shares. Return dated August 12th, 1937. All shares taken up. £350 paid. £150 considered as paid. Mortgages and charges, nil.

Electro-Horticultural Equipment Co., Ltd. — Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated December 2nd, 1937, to secure £2,400. Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated December 11th, 1937, to secure £100. Holders: Associated Electrical Industries, Ltd., Crown House, Aldwych, W.C.2.

Ramsdens Patents, Ltd.—Particulars filed of debentures for not more than £1,000, authorised November 26th, 1937, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £200.

Thorpe & Thorpe, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated December 10th, 1937, to secure £2,000. Holder: P. D. Jones, Temple Towers, Basingstoke.

City Notes

Vactric, Ltd., held its annual meeting on Tuesday last, when Mr. S. Kingsley Tubbs (chairman), who presided, said that, while the sales had again constituted a record, it was not possible to reap the full benefit of the larger turnover owing to increased costs of raw material and labour, as well as a rise in selling expenses. The company's offices and factory at Cricklewood were seriously damaged by fire in May last. The sales section had planned a campaign for that month, involving a considerable addition to the staff of sales representatives, and a competition was to be held among the representatives for the promotion of further sales during May. In consequence of the fire much of the benefit of the effort was nullified. However, the rebuilding of the damaged premises was nearly completed. Considerable progress had been made in connection with the erection of a new factory and offices at Queensbury, which, it was hoped, would be in service in February. Apex-Vactric, Ltd., their subsidiary, was formed to acquire the exclusive manufacturing and selling rights of "Apex" products in certain countries, Vactric, Ltd., undertaking to subscribe £30,000 in cash for three-quarters of the capital of the new company. Apex-Vactric goods were now being sold by some of the largest department stores and by a number of the larger supply companies. Steps were being taken to develop the Apex-Vactric business in some of the British colonies. Apex-Vactric, Ltd., through the acquisition of these rights over the "Apex" patents and trade marks, had acquired without extra cost the British rights over the patents relating to "Zephyr" air-conditioning apparatus.

R. A. Lister & Co., Ltd.—Presiding at the annual meeting held on December 17th Mr. P. Lister (chairman) said that the turnover for the year was again a record in the history of the company, and the increased volume had been spread over the entire range of their products. The trading results for the first full finanical year of their subsidiary, Blackstone & Co., Ltd., had been substantially improved. The new foundry at Dursley was now nearing completion. During the first half of the present financial year the increased costs of material and labour made it necessary for them to raise their prices. As a result of a study of ways and means of preventing a continuance of this upward tendency and the possibility of starting a move in the reverse direction, coupled with the benefits accruing from the activities of Blackstones and greatly increased production at Dursley, they had, since the close of the financial year, been able to announce a reduction in prices to become operative as from the beginning of the New Year. Given normal trading conditions the increased volume of business which the lower prices should make available would fully justify the reductions.

The General Cable Manufacturing Co., Ltd., held its annual meeting on December 15th when Mr. C. W. R. Pantlin (chairman), who presided, said that the sales for the past twelve months were, for the third year in succession, the largest in the history of the company, and the turnover for the year under review was up by 20 per cent. on that of the previous year. This success of their sales organisation offset to a large extent the raw materials situation and made possible the advance in profits. As to the future, the general trade outlook in the home market was good, and there was no reason to suppose that prosperous times would not continue if industry was allowed to carry on its normal business without interference from factors not under its control. The additional shop had been completed and had been running successfully during the greater part of the year. Subsequently they embarked on a further extension, which they anticipated would bring certain economies and so help to reduce their production costs.

Increases of Capital.—The nominal capital of the following companies has recently been increased to the extent shown:—Shoreham and District Electric Lighting & Power Co., Ltd., from £125,000 to £200,000; Settle and District Electricity Co., Ltd., from £50,000 to £100,000; Wigtownshire Electricity Co., Ltd., from £120,000 to £175,000; West Cambrian Power Co., Ltd., from £500,000 to £800,000; Buckrose Light & Power Co., Ltd., from £150,000 to £200,000; South-East Yorkshire Light & Power Co., Ltd., from £120,000 to £175,000; Electricity Co. of Macclesfield, Ltd., from £350,000 to £375,000; South Cumberland Electricity Supply Co., Ltd., from £100,000 to £125,000; Porthcawl Electricity Co., Ltd., from £40,000 to £75,000; Frinton-on-Sea and District Electric Light & Power Co., Ltd., from £50,000 to £100,000; Aberayron and District Electricity Supply & Power Co., Ltd., from £3,000 to £12,500; Monmouth Electricity Co., Ltd., from £35,000 to £50,000.

Baird Television, Ltd., in its report for the year ended June 30th shows that a further £111,903 has been transferred to general development account. The receipts amounted to £566 and expenses include £80,914 to laboratory, experimental, production research and publicity expenses. On November 30th, 1936, a large portion of the laboratories and workshops occupied by the company at the Crystal Palace was destroyed by fire, causing temporary disorganisation of their activities. A claim in respect of the assets destroyed was substantiated and settled in a satisfactory manner. New freehold premises have been acquired and are at present being made ready for occupation in the near future. Although the B.B.C. television station at Alexandra Palace has been in operation for over a year, public response to television has not come up to expectations. The reasons for this are outside the control of the company and commercial progress has consequently been severely hampered. Meeting: December 29th.

The Adelaide Electric Supply Co. reports gross receipts for the year ended August 31st last of £964,493, as compared with £878,910 in the preceding year, and a net revenue of £482,953 (against £422,712). After providing for debenture interest and sinking funds, the net profit was £377,554 (£332,432), of which £107,026 is placed to reserve. The ordinary dividend for the year is maintained at 10 per cent. by a final dividend of 5 per cent., and the balance carried forward is increased by £33,444 to £146,835. The number of consumers connected to the mains increased by 3,146 to 94,798, the connections in kW rose by 12.7 per cent., and the kWh sold by 16.3 per cent.

Benham & Sons, Ltd.—Presiding at the annual meeting on December 21st Mr. S. J. Benham (managing director), in the course of his speech, mentioned that their turnover and net profit constituted records. He mentioned some of the important contracts carried out by the company for kitchen equipment, their "Panelite" heating system, and ventilating and air-conditioning plant. Branch offices had been opened during the year in Birmingham and Cape Town, and they had carried out extensive alterations at their works at Wandsworth. Judging from the number of estimates which they were lately sending out they should have another busy year.

Barton & Sons (1935), Ltd.—Presiding at the annual meeting on December 15th Mr. J. E. Hodgkin (chairman), in reviewing the progress of the concerns which the company controls, said that in the case of Barton Conduits, Ltd., they had doubled the area and capacity of the original works and had installed an American tube-making machine which produced conduit tubing in all sizes from ⅜-in. to 2-in. at a rate up to 50 ft. per minute. The neon business, carried on principally in London, had been reorganised during the year and was now running on profitable lines.

British Automatic Refrigerators (1936), Ltd., in its first report for the period November 4th, 1936, to September 30th, 1937, shows a net balance of £9,048, which has been transferred to general reserve against current assets. No cash dividend is recommended, but the directors propose to capitalise £2,020 of the share premium account and to give a free bonus of one "A" share for every 16 "A" or "B" shares held.

Telephone Rentals, Ltd., has announced an interim dividend of 4 per cent. (same). The 400,000 shares of 5s. each issued in June last do not rank for this dividend, but they will participate in any final distribution that may be made.

The Rheostatic Co. is paying a final dividend of 8 per cent., less tax, making 12 per cent. for the year to September 30th. The company was registered in January last.

The United River Plate Telephone Co. is maintaining its interim dividend at 1 per cent., less tax, on the increased ordinary capital of £7,800,000.

The Cape Electric Tramways has announced a dividend of 5 per cent. for the year to June 30th.

Stocks and Shares

TUESDAY EVENING.

IT is apparent that Stock Exchange markets will wind up the year in a better frame of mind than a few weeks ago would have seemed possible. The semi-panic which occurred at the end of November, due to a variety of reasons, financial and political, has been succeeded by a more tranquil state of affairs. The shares which at that time were flung overboard have passed into more permanent hands. Confidence has been restored to a great extent, although there is still a measure of "slump complex," as some people call it, to be heard in various quarters. Official assurances from the Government, from captains of industry, and other responsible directions, to the effect that national trade continues to be satisfactory and that the outlook is healthy, have gone far to re-establish that confidence. Money is still abundant. Gilt-edged stocks reflect, in their strength, the readiness of the safety-first investor to seek the purely investment channels.

The Cable and Wireless figures for last month, showing a sharp decline, are regarded with composure in view of the fact that they go against figures which a year ago included the expansion of communication activity caused by the abdication of King Edward VIII.

Fixed-interest Stocks

The gilt-edged market wavered slightly as a consequence of the latest far-Eastern shocks, but prices subsequently made up much of the lost ground. Investors were encouraged by heavy over-subscription of the latest Corporation loan, a 3½ per cent. stock offered at a point over par. Well-covered industrial debenture and preference issues have lost none of their attraction for the present mood. Home electricity supply debenture stocks are on a yield-basis of about 3½ per cent.; good preference shares in the same category return a little over 4 p.c. on the money. The list of electrical equipment preference shares on offer shows yields ranging from 4 per cent. on General Electric 6½ per cents., at 32s. 6d., to £5 2s. per cent. on English Electric six-and-a-halves, at 25s. 6d.

Industrial Markets and the Outlook

Industrial markets seem to be a centre of conflict between the feeling that prices are temptingly low, and hesitation over the manner in which the uncertain factors in the outlook may develop. For the past week or two, the optimists have had the better of things. On their side have been the Prime Minister's rebuff to dangerous slump-talk, and the Defence Minister's reminder that the armament programme's demands from industry are still growing. A stout argument against the possibility of slackening in industrial activity has come from the deliberate intention of some sections of industry to hold back the less pressing items of constructional and equipment work against the time when factories are not so busily occupied as they are at present. On the other side, prophets

of recession or depression have not had a great deal to work on, except in the shape of the latest unemployment figures. It is recognised, of course, that the pace of recovery cannot be kept up indefinitely without help from the export field. While this remains uncertain, the more hopeful news from America and other parts of the world has helped in the diffusion of seasonable cheerfulness.

Electricity Supply

The market in Home electricity supply shares awaits with composure such legislation as Parliament may have in store for reorganisation of the industry. The past week has again seen no material change in prices. A line of North-Eastern Electric ordinary shares is on offer at 32s. 3d. The dividend for last year was raised from 6 to 7 per cent.; at the latter rate, the yield works out at £4 6s. 9d. on the money. Also on offer are lines of British Power and Light ordinary, at 26s. 6d., and Mersey Power ordinary at 33s. 6d. In each case the yield is within a few pence of 4½ per cent. Southern Areas can be bought at 21s. 6d.; this year's interim dividend has been raised from 1½ to 2 per cent., so that expectation looks for a rather higher return than the £4 3s. 9d. per cent. calculated on the last full year's distribution of 4½ per cent. In the foreign group, Palestine Electric shares are available at 31s., to pay £4 16s. 9d., free of tax, on the money. Nigerian Electric preferred, at 21s. 6d., return practically 7 per cent., and Kalgoorlie Electric, at 12s., exactly 6¼ per cent. on the money.

Mid-Cheshire Electric

Of the 300,000 Mid-Cheshire Electric 4 per cent. preference shares recently offered to the company's own shareholders at the par price of £1, it is understood that about a third were taken. The balance, some 200,000 shares, were subsequently placed and, subject to Stock Exchange leave to deal in them being granted, are now available in the market at 20s. 3d., free of stamp and fee. On last year's profits, the dividend service is well covered. A dividend of about one-eighth of a penny per share is payable next March: the September, 1938, dividend will be 4d. per share. Thereafter the full 4 per cent. will be paid. The shares constitute a sound investment in their class.

Cable and Wireless Traffics

On publication of the cable traffics index for November, prices of Cable and Wireless stocks turned a little reactionary, but quickly regained the better quotations which have ruled since expectation toyed with the idea of a revision of the combine's charter. The latest index number is the first of this year to fall below the corresponding figure for 1936; at the end of last year, however, traffics were being swollen abnormally as a result of our constitutional crisis. That the fall of 4 points in the index figures between October and November is regarded as normal can be judged from the steadiness of the ordinary and preference stocks. The market is inclined, in any case, to pay less attention to current traffics than to the foreshadowed negotiations between the combine and the Empire Governments.

Equipment and Manufacturing

The undertone in the electrical equipment market echoes the better feeling noticeable amongst industrials genrally. Prices of one or two of the leading shares have moved upwards. Associated Electricals, at 45s., are 1s. to the good; General Electrics have recovered from 76s. to 77s. 6d. Elsewhere, interest is still intrigued by speculation as to the coming dividends from the Westinghouse Brake and Consolidated Signal companies. The latter shares have spurted afresh from 5½ to 5¼, and Westinghouse Brakes are up from 59s. to 63s. 9d. Estimates of the Westinghouse Brake dividend are 17½ or 20 per cent., against last year's 15 per cent. Ismay Industries are in demand at 6s. on anticipation of developments to come. Allen Wests hardened to a little over 7s. Johnson and Phillips shed 1/16, to 41s. 3d., but other cable shares are firm. Lancashire Dynamos put on 1/16, to 3¼. There is a small improvement in Automatic Telephones, at 2 1/16. Others to move upwards are Laurence Scott "A" shares 11s. 9d., Strand Electrics 5s. 9d., and Telephone Rentals 10s. The return of public confidence to this group is further evidenced by advances in Associated Electrical ordinary and preference, Callenders, Lancashire Dynamo, Ericssons, and English Electrics.

Miscellaneous Matters

A further recovery in Brazilian Tractions, now 14, left the price half a point higher on the week. The price has risen on hopes that the new Dictator has no nationalistic designs on undertakings financed from outside the country. British Electric Traction deferred, at 1040, shows a 40 points rise, and Tillings, at 61s. 3d., are 1s. 6d. to the good. Home railway stocks have been in better demand. Anglo-Argentine Tramways debenture stocks have gone ahead by reason of a hope that the company will be allowed to raise its rates. The 5 per cent. debenture is 9 points better at 24½. An improvement of 30s. is shown by Great Northern Telegraphs, at 39½. Transatlantic communication stocks are disposed to be dull, with American "Tel. and Tel." at 146¼, ex dividend, and Western Unions at 23¼. Steel and engineering shares took heart from Sir Thomas Inskip's armaments speech: Vickers are up to 26s. The rubber market has shown itself indifferent to the big cut in the production quota.

Share List of Electrical Companies

	Dividend. Nom.	Previous.	Last.	Price Dec. 21.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/-	—	4 8 3
Clyde Valley	1	7	8	2	—	4 0 0
County of London	1	10½	10½	49/-	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/-	—	4 4 10
Do. Ord.	1	8	9	38/-	—	4 14 9
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/-	—	4 12 5
Lancs Light and Power	1	7½	7½	33/-	—	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	45/-	—	4 9 0
Midland Counties	1	7½	8	37/6	—	4 5 0
Mid. Elec. Power	1	8	9	2 1/16	—	4 7 4
North Eastern Electric Ordinary	1	6	7	32/-	—	4 7 6
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	45/-	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	47/6	—	4 4 2
Do. do. 6% Pref.	1	6	6	30/-	—	4 0 0
Scottish Power	1	8	8	37/-	—	4 6 6
South London	1	7	7	32/6	+6d.	4 6 2
Whitehall Elec. Invst 7½% Pref.	1	7½	7½	21/6	+6d.	6 19 6
Yorkshire Elec.	1	8	8	39/6	—	4 1 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 3
Do. 1955–75	,,	5	5	116	—	4 6 2
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	98	—	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	91	—	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	112	—	4 0 4
London Passenger Transport, A	,,	—	4½	117½	+	3 16 9
Do. do. B	,,	—	5	120½	—	4 3 0
Do. do. C	,,	4	4½	80	—	5 6 3
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	146¼xd.	—	6 2 10
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4½	5½	102½	—	5 7 5
Do. Ord.	,,	—	—	66½	—	—
Do. Income	,,	—	—	101½	+1	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	15½xd.	—	3 13 4
Do. do. Pref.	10	6	6	13⅞	—	4 6 6
Great Northern Tel.	10	20	20	39½	+1½	5 1 0
Marconi-Marine	1	10	7½	28/9	—	5 4 4
Oriental Telephone Ord.	1	12*	12*	2⅞	—	4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	24½	+9	—
British Electric Traction Def. Ord.	,,	5	5	1040	+40	—
Do. do. Pref. Ord.	,,	8	8	165	+5	4 17 0
Brazil Traction	$100	70 cts.	$1	14	+½	7 2 10
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	12	3 1/16	—	4 0 0
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	—	—	7 10 0
Assoc. Elec. Ord.	1	8	10	45/-	+1/-	4 9 0
Do. Pref.	1	8	8	38/-xd.	+1/-	4 4 6
Babcock & Wilcox	1	8	10	43/3	+9d.	4 12 6
British Aluminium Ord.	1	7½	10	46/3	+6d.	4 6 0
British Insulated Ord.	Stock	20	20	4⅜	—	4 6 6
Brush Ord.	Stock	Nil	Nil	27	—	—
Callender's	1	15	15	4 7/16	+ 1/16	3 9 1
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	2½	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1 13/16	- 1/16	5 10 4
Enfield Cable Ord.	1	25	25	5½	—	4 17 8
English Electric	1	Nil	Nil	29/6	+6d.	—
Do. do. Pref.	1	6½	6½	25/6	—	5 2 0
Ericsson Tel.	5/-	20	25	2⅛	+ 1/16	2 18 10
Ever Ready	5/-	35	45	26/-	—	8 13 2
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17⅛	77/6	+1/6	4 11 0
Henley's	5/-	30	15	19/6	—	3 16 10
Do. 4½% Pref.	1	4½	4½	1⅛	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	½	10	41/3	- 1/16	4 17 0
Lancashire Dynamo	1	10	20	3¼	+ 1/16	6 3 1
Siemens Ord.	1	6	7½	28/9	—	5 4 4
Telegraph Construction	£1	Nil	7½	2 1/16	—	3 5 0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patents agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

5322. "Electric pick-up mechanisms." A. F. Sykes. February 21st, 1936. (Cognate applications 3897/37 and 4038/37.) (475788.)

5357. "Electric cables." J. Collard. February 22nd, 1936. (475726.)

5539. "Television or picture-receiving systems." C. L. Faudell and N. Atkinson. February 24th, 1936. (Cognate application 32348/36.) (475728.)

8295. "Voltage-regulating systems." A. D. Blumlein. March 19th, 1936. (475729.)

11175. "Separation into classes of mixed materials of different electrical conductivities." Birtley Co., Ltd., K. C. Appleyard and S. D. Pollitt. April 18th, 1936. (475645.)

11608. "Cabinets for gramophones, radio receivers, television receivers, and the like." Baird Television, Ltd., and E. J. Treasure. April 23rd, 1936. (475735.)

14114. "Magnetically operated electrical interrupter." Allgemeine Elektricitats-Ges. May 17th, 1935. (475577.)

14243. "Television." Electric & Musical Industries, Ltd., and H. G. Lubszynski. May 20th, 1936. (475928.)

14405. "Diaphragms responding to or reproducing sound." Murphy Radio, Ltd., and A. K. Webb. May 21st, 1936. (475869.)

14505. "Fluorescent screens." S. T. Henderson. May 22nd, 1936. (475582.)

14535. "Electric motor controllers." General Electric Co., Ltd., and E. H. Croft. May 22nd, 1936. (475798.)

14544. "Portable electric battery lamps." R. J. Plummer and Ceag, Ltd. May 22nd, 1936. (475799.)

14594. "Electrostatic condensers." R. Bosch Akt.-Ges. June 26th, 1935. (Addition to 5538/35.) (475654.)

14651. "Electrolytic process and apparatus for descaling and/or cleaning metals." J. F. Hinsley. May 23rd, 1936. (475929.)

14655. "Single-phase transformers adapted for connection with three-phase supply networks." E. Fries. May 23rd, 1936. (475658.)

14701. "Band resistances for the continuous regulation of heavy-currents." Akt.-Ges. Brown, Boveri & Cie. July 19th, 1935. (Addition to 467574.) (475931.)

14714. "Light-sensitive electron-discharge devices." Baird Television, Ltd., and E. B. King. May 25th, 1936. (Cognate application 22980/36.) (475807.)

14775. "Light valves for photographically recording sound." United Research Corporation. June 24th, 1935. (475812.)

14880. "Telephone systems." Automatic Electric Co., Ltd. (in liquidation), F. E. Comyn. May 26th, 1936. (475874.)

14892. "Circuits employing condensers." British Thomson-Houston Co., Ltd. May 27th, 1935. (475743.)

14986. "Variable-ratio drives for variable electrical impedances." Burndept, Ltd., R. P. Richardson and H. H. V. Stanley. May 27th, 1936. (475744.)

15057. "Electric fires." Ferranti, Ltd., and J. H. Watkiss. May 28th, 1936. (475885.)

15091. "Means for suspending electric cables from messenger wires." Rediffusion, Ltd., E. A. Richards and J. S. Newall. May 28th, 1936. (475944.)

15092. "Electric connectors." Rediffusion, Ltd., E. A. Richards and J. S. Newall. May 28th, 1936. (475945.)

15093. "Electric junction-boxes." Rediffusion, Ltd., and J. S. Newall. May 28th, 1936. (475946.)

15211. "Wireless receiving apparatus." J. Robinson. May 29th, 1936. (475900.)

15230. "Recording transients on electric power circuits and the like." Standard Telephones & Cables, Ltd., and D. I. McGillewie. May 29th, 1936. (475903.)

15399. "Electric-discharge devices." M-O Valve Co., Ltd., and C. J. Smithells. June 2nd, 1936. (475665.)

15761. "Plug-and-socket connectors for electric circuits." C. L. Arnold, R. W. Dowsett and M. K. Electric, Ltd. June 5th, 1936. (475824.)

15920. "Resistance thermometer elements." Elliott Bros. (London), Ltd., D. C. Harben and F. G. Collins. June 6th, 1936. (475667.)

16876. "Electric generators for speed-indicators." British Thomson-Houston Co., Ltd., and L. Griffiths. June 17th, 1936. (475825.)

18120. "Oscillation generators." Telephone Manufacturing Co., Ltd., and L. H. Paddle. June 30th, 1936. (Addition to 450967.) (475673.)

18510. "Skid or slipper trolley heads for collecting current in overhead electric traction systems." Brecknell, Willis & Co., Ltd., and G. W. Jarman. July 3rd, 1936. (475592.)

19713. "Automatic telephone systems." Ericsson Telephones, Ltd., and L. H. Drysdale. July 16th, 1936. (475749.)

20125. "Electric-wave signalling." A. G. Cooley. July 20th, 1936. (475750.)

20556. "Frequency-reducing valve circuits." Radioakt.-Ges D. S. Loewe. July 27th, 1935. (475595.)

22482. "Electrically controlled counters." Etablissements F. Jaeger. June 27th, 1936. (475753.)

22662. "Thermostatically controlled containers." Marconi's Wireless Telegraph Co., Ltd. August 15th, 1935. (475681.)

23136. "Electric hair-waving apparatus." M. Calderon and M. Calderon, Ltd. August 22nd, 1936. (475754.)

23869. "Electrical insulating material." Allgemeine Elektricitats-Ges. August 31st, 1935. (475684.)

24447. "Electrical fuses." H. G. Baggs. September 8th, 1936. (475685.)

25768. "Ammeters for high-frequency alternating currents." J. T. Shevlin (Siemens & Halske Akt.-Ges.) September 22nd, 1936. (475687.)

26691. "Electrolytic condensers." L. W. Meyer (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) October 1st, 1936. (Convention date not granted.) (475833.)

26808. "Internal-combustion engine electric power units." Sulzer Freres Soc. Anon. February 12th, 1936. (475603.)

30337. "Cooling of hot material extruded through presses, particularly presses for lead sheathing of cables." Standard Telephones and Cables, Ltd. April 23rd, 1936. (475836.)

33427. "Sparking plugs for internal-combustion engines." C. M. Carington, A. E. Postlethwaite, and Sparking Plugs, Ltd. December 5th, 1936. (475838.)

33844. "Manufacture of loudspeakers for radio receiving apparatus or for other sound reproduction purposes." I. Walker. February 1st, 1936. (475839.)

34293. "High-frequency electric cables." Siemens & Halske Akt.-Ges. December 12th, 1935. (475703.)

34477. "Electric cables." Siemens & Halske Akt.-Ges. December 21st, 1935. (475704.)

35310. "Manufacture of electrically insulating materials." British Thomson-Houston Co., Ltd. December 28th, 1935. (475756.)

35444. "Electrolytic condensers and electrolytes therefore." Mallory Patents Holding Co., Ltd. January 7th, 1936. (475757.)

1937

250. "Electric fire alarms." T. Slusarz. January 25th, 1936. (475759.)

833. "Veneering of metallic surfaces for electric welding." M. W. Kellogg Co. February 18th, 1936. (475709.)

2211. "Electron-discharge tubes and methods of manufacturing such tubes." C. Lorenz Akt.-Ges. January 30th, 1936. (475846.)

3083. "Auxiliary windings for three-phase transformers." Soc. Savoisienne de Constructions Electriques. February 15th, 1936. (475613.)

3929. "Electro-optical image transmission systems." Electrical Research Products, Inc. March 4th, 1936. (475715.)

4555. "Electric-discharge apparatus." Siemens & Halske Akt.-Ges. February 14th, 1936. (Cognate application 4556/37.) (475763.)

4781. "Cores for dynamo-electric machines." British Thomson-Houston Co., Ltd. February 18th, 1936. (475717.)

4798. "Electrolytic coating of metals." Ford Motor Co., Ltd. May 16th, 1936. (475848.)

5033. "High-frequency signalling systems." L. Pungs. February 21st, 1936. (475718.)

6285. "Cathodes of thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. March 3rd, 1936. (Addition to 444844.) (475620.)

6948. "Thermionic modulator circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. March 9th, 1936. (475621.)

8887. "Carrier-wave demodulating systems and apparatus." Standard Telephones & Cables, Ltd. May 5th, 1936. (475768.)

9456. "Electron-discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. April 2nd, 1936. (475769.)

9901. "Navigation-aiding radio systems for assisting blind landing of aircraft." Telefunken Ges für Drahtlose Telegraphie. April 9th, 1936. (475853.)

10387. "Electric incandescent lamps for photographic darkroom purposes." General Electric Co., Ltd. June 24th, 1936. (475771.)

10417. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 14th, 1936. (475772.)

11147. "Electric immersion heaters." British Thomson-Houston Co., Ltd. April 22nd, 1936. (475630.)

11568. "Ultra-short wave radio aerial systems." Telefunken Ges. für Drahtlose Telegraphie. April 22nd, 1936. (475855.)

11745. "Drying apparatus using electric fields produced by high-frequency alternating currents." Siemens-Schuckertwerke Akt.-Ges. May 13th, 1936. (475631.)

13326. "Wireless receiving apparatus." F. H. Beaumont and Milnes Radio Co., Ltd. May 10th, 1937. (475722.)

17779. "Electromagnetic devices." British Thomson-Houston Co., Ltd. June 25th, 1936. (475640.)

20547. "Method and device for the remote tuning of radio receiving apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 27th, 1936. (475643.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 15th.

Unifa. No. 580734. Class 6. Welding machines and parts thereof.—A. Arc, Ltd., 52a, Goldhawk Road, Shepherd's Bush, W.12.

Amphenol. No. 579597. All goods in Class 8, but not including telephone apparatus.—American Phenolic Corporation, Chicago, U.S.A. (British representatives, Lloyd Wise & Co., 10, New Court, Lincoln's Inn, W.C.2.)

Philidyne. No. 580459. Class 13. Electric lamps (ordinary), head and rear lamps and reflectors for vehicles and velocipedes. —Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Electricity in Collieries

Speaking at the annual dinner of the West of Scotland Branch of the Association of Mining Electrical Engineers which was held in Glasgow, Mr. J. A. B. Horsley (president) pointed out that the number of accidents due to the use of electricity in mines was an insignificant fraction of the total number of accidents from all causes. Undue prominence was sometimes given to its risks, while its advantages economically and in the reduction of heavy muscular labour did not receive due consideration. Referring to the evidence given before the Royal Commission that electricians in South Wales were almost without exception receiving a minimum subsistence wage, Mr. Horsley remarked that the colliery electrician played a prominent part in the economical working of the mines and should receive a wage commensurate with his skill. Mr. S. Winstanley proposed the toast of "The Guests," and Major H. Pell (chairman, I.E.E. Scottish Centre) replied. The health of the chairman was proposed by Mr. James Lawson.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory, Bollo Bridge Road; Adelaide Grey, Ltd., 71, Avenue Road, London, W.3.

Ashton-under-Lyne.—Houses (72), Pelham Street, &c.; Urban Development Co., Ltd.

Ayr.—Houses (152), Whitletts (£65,967); burgh surveyor.

Ayrshire.—Schools, Braehead, Ayr, and Maybole, for the C.C.

Berwick-on-Tweed.—Cinema, Golden Square, for J. F. Macfarlane; J. H. Simson, architect, Newcastle-on-Tyne.

Bexley.—Cinema, with shops, Rochester Way, for D. Weston; A. W. Kenyon, architect, 21, Bedford Square, London, W.C.1.

Birtley (Co. DURHAM).—Cinema; H. Wiles, architect, Bideford Gardens, Low Fell, Gateshead-on-Tyne.

Blackburn.—Houses (67) and shops &c., Old Park Lane and Roman Road; Bainbridge Bros., Ltd., 19, Somerset Drive, Bury. Extensions to works, Scholes, for Rostron, Ltd., Artillery Street.

Boston.—Two schools (£60,000) (in one block), Robin Hood Walk; clerk to Council, Municipal Offices.

Brownhills.—Houses (500), Pelsall Lane and Hussey Fields estate; F. S. Harrison, U.D.C. surveyor.

Burton-on-Trent.—Extensions to Town Hall; borough surveyor.

Bury.—Houses (480), Chesham Fold; borough engineer.

Byfleet.—Cinema, High Road and Oyster Lane, for the New Era Cinema Co., Ltd.; Seth-Smith, Monro & Matthew, architects, 46, Lincoln's Inn Fields, London, W.C.2.

Carlisle.—Houses (24), Uldale Road; H. Irving Graham, architect. Extensions to hospital (£14,000); city engineer.

Clayton-le-Moors.—Extensions to works, for James Broadley, Ltd., William Street.

Colchester.—Public library (£18,350); borough surveyor.

Coventry.—Factory, Banner Lane, Tile Hill, for A. C. Wickman, Ltd.

Croydon.—Fire station; borough engineer. School, Lodge Lane, for the E.C.

Darlington.—Houses (16), Neville Road, &c.; H. Parvin and Sons, builders, 17, Horsemarket.

Dorset.—School buildings, for Foster's school, Sherborne, for the E.C.; Broad & Dockerill, quantity surveyors, 42-44, Holdenhurst Road, Bournemouth.

Ealing.—Eleven blocks of flats, Oldfield Lane, for R.S.P. Properties, Ltd.; F. H. Shearley, architect, 336a, Station Road, Harrow. Factory and offices, Wadsworth Road; Flash Fasteners, Ltd., 6, Basset Chambers, Bedfordbury, London, W.C.2.

Edinburgh.—Bank premises, 94, Princes Street, for Bank of Scotland.

Edmonton.—Cinema, Cambridge Arterial Road, for A. W. Pearce.

Flintshire.—School, Mold (£37,908), for the County E.C.

Gainsborough (LINCOLNSHIRE).—Bus station, Roseway; clerk, Council Offices.

Gateshead-on-Tyne.—Factory, for Hunters, Ltd.; W. F. Edwards, architect, Colmore Chambers, Newall Street, Birmingham, 3.

Glasgow.—Houses, Ibrox and Pollokshaws; burgh surveyor.

Gloucester.—Technical college, Crypt site; borough surveyor.

Gloucestershire.—Premises, for Pate's Grammar School, Cheltenham (£77,889), for the County E.C.

Gosport.—Cinema, for London & Southern Super Cinemas, Ltd.; F. Mitchell, architect, 80, George Street, Portman Square, London, W.1.

Grimsby.—Municipal hospital, nurses' home, &c.; H. S. Hall, architect, Grimsby.

Hanley.—Houses (40), Queen's Road; R. Ray & Sons.

Harrow.—Houses (182), four sites, Pinner; London Provincial Building Co., Ltd., 113, Park Street, London, W.1.

Hayes.—Cinema and shops, East Avenue, for London and Southern Super Cinemas, Ltd.; Berkeley Construction Co., Ltd., 164, Aldersgate Street, London, E.C.1.

Hebburn-on-Tyne.—Houses (22) in flats, Black Lane. Carr-Ellison Estates, Ltd., Collingwood Street, Newcastle-on-Tyne.

Heywood.—Houses (308); A. Middleton, borough surveyor.

Hinckley (LEICESTERSHIRE).—Operating theatre and kitchen block for the Hinckley and District Hospital; hospital secretary.

Hyde.—Extensions to works, Randal Street; British Malt Yeast Co., Ltd.

Kearsley.—Houses (24), Prestolee; J. F. Moyse, surveyor, Town Hall.

Lancashire.—School, Farington, Preston, for the County E.C.; J. C. Prestwich & Sons, architects, Bradshaw Gate, Leigh. School, Maghull, Liverpool, for the E.C.; W. A. Gale, Ltd., contractors, Linacre Lane, Bootle, near Liverpool. School, clinic and child welfare centre, Huyton Derby Road, for the E.C.; W. Lothian & Son, contractors, Broad Green Road, Liverpool.

Leicester.—Bus station, Burleys Lane; clerk, City Council, Municipal Offices.

Letchworth.—Library (£11,125); U.D.C. surveyor.

Lincoln.—Factory, Newark Road, for Smith's Potato Crisps (1929), Ltd., Great West Road, Brentford, Middlesex; C. A. Hayes & Sons, Ltd., contractors, St. Thomas Street, Bristol.

Llandudno.—Extensions to premises for J. Waterworth & Sons, Madoc Street.

London.—(FULHAM).—Dwellings (30), Field Road; borough surveyor, Town Hall, S.W.6. (ISLINGTON).—Tenements, Hillrise Road (£65,000); E. C. P. Monson, architect, Finsbury Pavement House, E.C.2. (POPLAR).—Cinema, Bow Road; A. Mather, Leicester Square Chambers, Leicester Square, W.C.2. Extensions to chemical works, Hackney Wick; Hal Williams & Co., 43, Bedford Square, W.C.1. Reconstruction of Rudd's premises, Blair Street; H. J. Starkey, 15, Curzon Street, W.1. (S.E.11).—Cinema, Kennington Park Road, for Odeon Cinema Holdings, Ltd., Birmingham; J. Coles, architect, 40, Craven Street, London, W.C.2. (WESTMINSTER).—Shops and offices, Mount Street; Wimperis, Simpson & Guthrie, 61, South Molton Street, W.1. (WOOLWICH).—Stores, Powis Street, for the Royal Arsenal Co-operative Society, Ltd.; S. W. Ackroyd, architect, 177, Avery Hill Road, London, S.E.9.

Lye.—Extensions to Regent Engraving works, Stourbridge Road, for G. F. Higgin & Sons, Ltd.

Manchester.—Extensions (£200,000) to technical college, Granby Row; Bradshaw, Gass & Hope, architects, 19, Silver well Street, Bolton.

Middlesex.—Children's home, Hatton Road, East Bedfont (£13,000), convalescent home, Netley Castle, Southampton (£28,000), and extensions to County hospital, Hillingdon (£721,000), and West Middlesex County hospital (£224,751); county architect.

Milford Haven.—Store premises, 64-66, Charles Street, for F. W. Woolworth & Co., Ltd.

Newport (MONMOUTHSHIRE).—Houses (24), Brynglas Road; borough architect, Town Hall.

Norwich.—Cinema, Dereham Road; V. E. Harrison, Homelea, Ipswich Road. Library, Lakenham; city architect. Offices and clinic, City hall site (£49,708); James & Pierce, architects. School, Earlham estate (£30,113); Bush Builders, Ltd.

Nuneaton.—Fire station, Newtown Road (£14,000); borough surveyor.

Oxford.—Branch premises, Magdalen Street, for Prudential Assurance Co., Ltd.; T. H. Kingerlee & Sons, builders, Queen Street.

Paisley.—Extensions to works for Siegwart Fire Proof Co., Ltd., Harborn Lane.

Pelaw-on-Tyne.—Cabinet factory for Co-operative Wholesale Society; C.W.S. architects' dept., 90, Westmoreland Road, Newcastle-on-Tyne.

Perth.—Church, Muirton; clerk, Perth Presbytery.

Ponder's End.—Technical college (£76,519); Kent & Sussex Building Co., Ltd.

Rotherham.—Extensions to works, Meadow Bank Road, for the Rother Boiling Co., Ltd.

Runcorn.—Cinema, with shops, Greenway Road, for the Cheshire County Cinemas, Ltd.; W. & S. Owen, architects, Palmyra Square Chambers, Warrington.

Rushden.—Houses (20), Newton Road estate; J. W. Lloyd, U.D.C. surveyor, Council Buildings.

Ruthin (DENBIGHSHIRE).—Houses (36), Cae Llo, Park Road; P. E. Thomas, borough surveyor, Town Hall.

Sedgley.—Houses (90), Lower Gornal; T. R. Knight, clerk to U.D.C., Council House.

Sheffield.—Factory, Clay Lane and Eyre Lane, for W. Turner & Bros., Ltd.; F. W. Hindley, builder, Rockingham Street.

Shiney Row (Co. DURHAM).—Cinema, for E. J. Hinge, of Cinemas, Ltd., Newcastle-on-Tyne; J. H. Simson, architect, Granger Street, Newcastle-on-Tyne.

Southall.—Extensions to County school (£24,300); G. H. Burgess.

Southend-on-Sea.—Municipal hospital and administration buildings, Rochford, Essex; R. H. Dyer, borough engineer, Municipal Buildings.

Stanley (Co. DURHAM).—Houses (133); U.D.C. surveyor.

Stockport.—Houses (194), Walnut Tree Farm, Cheadle Hulme (£75,300); G. & J. Seddon, Ltd., builders, Little Hulden, near Bolton.

Stoke-on-Trent.—Houses (48), near Ashwood Terrace, Longton; Lockwood & Sproston. Houses (52), near Blurton Road; H. Leese & Co., Ltd. Cinema, Stone Road, Trent Vale; E. Pointon. Development of Brampton Farm estate; J. Cooke. Development of Holden House Farm estate, Sneyd Green; Shenton Bros. Pottery works, Barlaston, for Wedgwood & Sons, Ltd.; Keith Murray & C. S. White, architects, 19, Russell Square, London, W.C.1.

Stourbridge.—Houses (122), Hungary Hill (£44,400); W. J. Tolley, builder, Halesowen.

Sunderland.—Factory, Pallion estate, for the Saturn Oxygen Co., Ltd., 14, Finsbury Circus, London, E.C.2. Extensions to offices, Castle Street, for Vaux & Son; W. & T. R. Milburn, architects, 17, Fawcett Street.

Surrey.—Alterations and additions to County School for Girls, Whyteleafe (£32,096); county architect, Kingston-on-Thames.

Sussex.—School, Heathfield (£30,279), for the East Sussex E.C., Lewes.

Sutton-in-Ashfield.—Houses (154) and bungalows, Hardwick Lane; Warner & Dean, architects, Mansfield Road, Sutton.

Swansea.—Houses (22), Heol Cwyrosydd; W. A. Ludwig. Houses (14), Plough Road; A. J. Anthony. Extensions to Grand Hotel, Ivey Place; Great Western Railway Co.

Thrapston.—Factory premises, Oundle Road, for Ideal Clothiers, Ltd.

Trimdon.—Houses (110), for North-Eastern Housing Association; Tasker & Child, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Uxbridge.—Houses (140), Hillingdon; H. C. Haslam & Co.

West Hartlepool.—Houses (100), Milbank estate; borough engineer.

Weymouth.—Houses (88) and flats, Golderoft estate (£34,210); James Bros.

Witham.—Houses (82), Church Street; U.D.C. surveyor, Council Offices.

Yorkshire.—Mental hospital, Stapleton, near Pontefract (£500,000), for the West Riding C.C.; county architect, Wakefield.